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# Essays in Distributional Macroeconomics and Political Economy

## Essais en Macroéconomie de la Distribution et Économie Politique

Thèse préparé pour obtenir le grade de Docteur en Sciences Économiques par

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# Essays in Distributional Macroeconomics and Political Economy

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“*Quel a été l’effet de toutes ces restrictions? De réduire le nombre des ouvriers et des fabricants, de mettre par conséquent la fabrique entre les mains d’un plus petit nombre, de diminuer par là la concurrence, et de donner plus de facilité aux ouvriers d’exercer un monopole contre les fabricants, et à ceux-ci d’en exercer un autre à leur tour contre le public en renchérissant le prix de leurs étoffes.* ”

–Vincent de Gournay, “*Mémoire sur les corporations*” (1753)

“*What was the end result of all these regulations? It was to restrict the number of workers and manufacturers, to throw therefore the whole industry in the hands of a fewer number of people, and to give a better opportunity to workers to exercise a monopoly against manufacturers, and another to these manufacturers themselves against the general public, by raising the price of their cloths.*”

–Vincent de Gournay, “*A Memorial on Guilds*” (1753)

# Summary

## English Summary

This dissertation is concerned, broadly, with the intersection of Macroeconomics and Political Economy, with a special focus on the role played by firm heterogeneity in shaping economic outcomes. Central to all three chapters is the concept of firm heterogeneity, meaning that firms differ in some fundamental characteristic. For the purposes of this dissertation, the primary characteristic of interest is productivity, a key determinant of firm performance and behavior. This focus reflects a conscious shift from traditional macroeconomic models that often overlook the granularity provided by examining firms of different sizes and productivity levels, and instead rely on the assumption of the “representative firm”. By analyzing these differences, the dissertation aims to illuminate how productivity, as a single characteristic, influences firms’ strategic decisions, market concentration, and overall economic performance.

The first chapter, the sole out of the three to be purely theoretical, proposes a mechanism by which lobbying by Special Interest Groups within an industry can influence its level of concentration, and fleshes out three special cases therein. The second chapter studies the link between concentration and political contributions within the specific context of the economy of the United States, from 1990 to 2018, links the literatures of political economy of lobbying with that of macroeconomic market power, and presents causal evidence of the effect of political contributions on the documented rise in the

concentration of economic activity in the U.S. economy. The third chapter investigates the impact of foreign workers on export decisions in a Vietnamese context, with an emphasis on how this impact varies along the firm size distribution, and finds that the presence of foreign workers mostly benefits larger firms in their export decisions.

## Résumé en Français

Cette thèse se concentre, de manière générale, sur l'intersection entre la macroéconomie et l'économie politique, avec un accent particulier sur le rôle joué par l'hétérogénéité des entreprises dans le façonnement des résultats économiques. Au cœur des trois chapitres se trouve le concept d'hétérogénéité des entreprises, signifiant que les entreprises diffèrent selon une caractéristique fondamentale. Pour les besoins de cette thèse, la caractéristique principale d'intérêt est la productivité, un déterminant clé de la performance et du comportement des entreprises. Cette focalisation reflète un changement conscient par rapport aux modèles macroéconomiques traditionnels qui ignorent souvent la granularité fournie par l'examen des entreprises de différentes tailles et niveaux de productivité, et reposent au lieu de cela sur l'hypothèse de l'entreprise "représentative". En analysant ces différences, la thèse vise à éclairer comment la productivité, en tant que caractéristique unique, influence les décisions stratégiques des entreprises, la concentration du marché et la performance économique globale.

Le premier chapitre, le seul des trois à être purement théorique, propose un mécanisme par lequel le lobbying par des groupes d'intérêt spéciaux au sein d'une industrie peut influencer son niveau de concentration, et développe trois cas spéciaux à cet égard. Le deuxième chapitre étudie le lien entre la concentration et les contributions politiques dans le contexte spécifique de l'économie des États-Unis, de 1990 à 2018, relie les littératures de l'économie politique du lobbying à celle du pouvoir de marché macroéconomique, et présente des preuves causales de l'effet des contributions politiques sur la montée documentée de la concentration de l'activité économique dans l'économie américaine. Le troisième chapitre examine l'impact des travailleurs étrangers sur les décisions d'exportation dans un contexte vietnamien, avec un accent sur la manière dont cet impact varie le long de la distribution de la taille des entreprises.

# Samenvatting in het Nederlands

Dit proefschrift richt zich in brede zin op de intersectie tussen macro-economie en politieke economie, met een speciale focus op de rol die bedrijfsheterogeniteit speelt bij het vormgeven van economische uitkomsten. Centraal in alle drie de hoofdstukken staat het concept van bedrijfsheterogeniteit, wat betekent dat bedrijven verschillen in een fundamentele karakteristiek. Voor dit proefschrift is de primaire kenmerk van interesse productiviteit, een belangrijke bepalende factor voor de prestaties en het gedrag van bedrijven. Deze focus weerspiegelt een bewuste verschuiving van traditionele macroeconomische modellen die vaak de granulariteit negeren die wordt geboden door bedrijven van verschillende groottes en productiviteitsniveaus te onderzoeken, en in plaats daarvan vertrouwen op de aanname van het "representatieve bedrijf". Door deze verschillen te analyseren, streeft het proefschrift ernaar te verhelderen hoe productiviteit, als een enkele karakteristiek, de strategische beslissingen van bedrijven, marktconcentratie en algehele economische prestaties beïnvloedt.

Het eerste hoofdstuk, het enige van de drie dat puur theoretisch is, stelt een mechanisme voor waardoor lobbyen door speciale belangengroepen binnen een industrie het concentratieniveau kan beïnvloeden, en werkt drie speciale gevallen daarin uit. Het tweede hoofdstuk bestudeert de link tussen concentratie en politieke bijdragen binnen de specifieke context van de economie van de Verenigde Staten, van 1990 tot 2018, verbindt de literatuur van politieke economie van lobbyen met die van macroeconomische marktmacht, en presenteert causaal bewijs van het effect van politieke bijdragen op de gedocumenteerde stijging van de concentratie van economische activiteit in de Amerikaanse economie. Het derde hoofdstuk onderzoekt de impact van buitenlandse werknemers op exportbeslissingen in een Vietnamese context, met nadruk op hoe deze impact varieert langs de bedrijfsgrootte distributie.

# Introduction

## Motivation

This dissertation is concerned, broadly, with the intersection of Macroeconomics and Political Economy, with a special emphasis on the role played by firm-level *idiosyncratic* behaviour in shaping economic outcomes. Central to all three chapters is the concept of *firm heterogeneity*, meaning that firms differ in some fundamental characteristic. For the purposes of this dissertation, the primary characteristic of interest is productivity, a key determinant of firm performance and behavior. This focus reflects a conscious shift from traditional macroeconomic models that often overlook the granularity provided by examining firms of different sizes and productivity levels, and instead rely on the assumption of the "representative firm". By analyzing these differences, the dissertation studies how productivity, as a single characteristic, influences firms' strategic decisions, as well as how its *distribution among firms* influences economic aggregates and market outcomes.

**Why is agent heterogeneity important?** Following the Great Recession, the global economy witnessed a resurgence of interest in understanding the role played by agent heterogeneity in aggregate-level outcomes. Chairwoman of the Federal Reserve Janet Yellen noted in a 2016 speech: "Prior to the financial crisis, these so-called representative-agent models were the dominant paradigm for analyzing many macroeconomic questions. However, a disaggregated approach seems needed to understand some key aspects of the Great Recession"(Yellen, 2016). Even though it was after the crisis that the importance of heterogeneity in economic models entered into the mainstream, the literature has a long history of exploring questions where economic agents differ in some fundamental characteristic, recognizing that explicitly modeling this heterogeneity is fundamental in the study of questions related to the study of, say, the distribution of income, wealth, or the size of firms, among others. Since early as the late 1970s, a trickle of research emerged, with a seminal paper by Bewley (1977), followed by a series of papers by Huggett (1993) and Aiyagari (1994), that laid the groundwork for the modern literature on demand-side agent heterogeneity in macroeconomics, initially developed to study the consumption and savings decisions of households. In these models, in contrast to the models presented in this dissertation, it is households that heterogeneity is present; a continuum of households that are ex-ante identical but face idiosyncratic income shocks that drive them to different consumption and savings decisions, giving rise to non-degenerate joint distributions of wealth and income.

By contrast, the models used throughout this dissertation focus on another form of agent heterogeneity, that of *firms*, where they differ in their level of productivity. As in the literature on household heterogeneity, the work on firm heterogeneity has also been instrumental in shaping our understanding of how differences among agents can lead to different economic outcomes. This literature has been particularly influential in shaping our understanding of growth and productivity dynamics, in particular in the context of international trade, where the heterogenous firms models have now become a standard framework of analysis. The seminal papers H. A. Hopenhayn (1992) and Melitz (2003a) are two key contributions in this regard. The former introduced a model of firm dynamics that allowed for the endogenous entry and exit of firms, with a focus on matching empirical cross-sectional properties of firm-level data, such as age, size, and profitability. The latter, extending the former towards a general equilibrium framework, leveraged the insights from the former to study the effects of trade liberalization on the reallocation of resources across firms within an industry. Around the same time, the economic development literature began to leverage these insights to study the role of firm heterogeneity behind the large dispersion in rates of return to capital within developing countries, and its implications for economic growth. The works of Banerjee and Moll (2010) and Banerjee and Duflo (2005) and more recently Buera and Shin (2013), Buera and Shin (2017), and Moll (2014) have all contributed to understanding how firm heterogeneity, plus the presence of financial frictions, can be traced back to high levels of dispersion to the return to capital *within* developing countries, and how this dispersion can be linked to differences in Total Factor Productivity (TFP) and economic growth *across* countries, highlighting the importance of understanding firm-level behavior and its determinants in shaping economic outcomes.

## Overview of this Dissertation

The theoretical models used throughout the three chapters that compose this dissertation provide a *framework* through which to interpret the underlying mechanisms that drive the behaviour under study in each of them. The empirical analyses, on the other hand, guided by the light provided by the theoretical models, interpret different sources of data to test for evidence that the behaviours predicted by the theory can indeed be observed.

### Chapter 1: Lobbying, Productivity and Market Concentration

The first chapter, the most theory-oriented of the three, embeds a *game* into an otherwise standard heterogenous firms model of an economy. This model, known informally as the *Melitz model*, was originally developed to study the intra-industry reallocations of labor following the openning of an economy to trade. Nowadays it is used widely used in a broad range of literatures to study a diverse set of issues; it has become *the workshorse* heterogenous firms model (Mrázová and Neary, 2018) . Originally introduced by Melitz (2003a), pioneered the use of firm heterogeneity to study an economic question that had been previously only been tackled by the traditional representative firm assumption. By borrowing H. A. Hopenhayn (1992)'s firm dynamics and embedding this behavior into the environment of Krugman (1980), Melitz was able to develop a model where the endogenous exit and entry of firms, driven by differences in productivity, resulted in changes to the size distribution of firms within an industry following a trade liberalization, with big firms becoming bigger, small firms becoming smaller, average productivity increasing, and the least productive firms exiting the market.

I start from this environment, and introduce a game where firms can lobby the government to influence two policy instruments, the cost of entry and the fixed cost of production. Together, these two fixed costs capture the level of regulatory burden that firms face in an economy. The game embedded into this economy is generally referred to as a *common agency game*, originally studied by Bernheim and Whinston (1986). Common-agency games deal with an intuitively familiar situation: an *agent* is tasked with making a choice, or performing an action, which has an effect on the well-being of more than one *principals*. Each of these principals attempts to influence the agent's final choice, taking into account the fact that every other principal will attempt the same thing. The game is a generalization of the *principal-agent* problem, where the agent is tasked with making a choice that affects the well-being of a single principal. As is common in game theory, the inherent complexity of the game gives rise to a multiplicity of equilibria if only the often weak notion of Nash Equilibrium is used to solve it. Nevertheless, stronger equilibrium notions are also found to be insuficient, with Subgame Perfect Nash Equilibrium also giving rise to a multiplicity of equilibria. The main contribution by Bernheim and Whinston (1986) was the introduction of a useful equilibrium notion, so-called *Truthful Nash Equilibria*, a refinement of Subgame Perfect Nash

Equilibria that allows for uniqueness in the solution of common agency games. Their theory was further developed and extended for its use in the context of policymaking by Dixit et al. (1997), but not before being used by Grossman and Helpman (1994) to study trade protectionist policies in their seminal "Protection for Sale" model, where firms lobby the government to influence trade policy. This paper is a direct descendant of the Grossman and Helpman (1994) model, but with a focus on the effects of lobbying on the firm size distribution and its level of concentration of its right tail, rather than on trade policy. I am able to show that, if firms join forces to lobby the government to change the regulatory environment to their benefit, this changes to the regulatory environment have a direct effect on the firm size distribution, and hence on the level of concentration of the industry. The chapter presents three special cases of the model, where different sections of the firm size distribution participate in the game. These "sections" are defined by the productivity of the firms. Indeed, one of the contributions of this chapter is to link the level of *competition* within an industry to the ex-ante incentives of firms to lobby the government, rationalizing the observed differences in political contributing behavior observed across industries, where firms in more competitive industries are found to be more likely to contribute to political campaigns through industry-wide organizations, while firms in less competitive industries are found to be more likely to contribute to political campaigns through individual donations Bombardini and Trebbi (2020) and Bombardini (2008).

## Chapter 2: Do Political Contributions affect Market Concentration? Evidence from the United States

The second chapter studies the link between concentration and political contributions within the specific context of the economy of the United States, from 1990 to 2018, links the literatures of political economy of lobbying with that of macroeconomic market power, and presents causal evidence of the effect of political contributions on the documented rise in the concentration of economic activity in the U.S. economy. The literature on the rise in concentration in the U.S. economy has been growing in recent years, with a particular focus on the potential causes of this rise (Autor et al., 2017; Autor et al., 2020c; Covarrubias et al., 2020). One of the earliest identified causes of this phenomenon was the rise of the so-called "superstar firms", a term coined by Rosen (1981) to describe firms that are able to capture a disproportionate share of the market, and hence of the profits, due to their superior productivity. Under this view, the rise in concentration is a natural consequence of the rise in the productivity of the most productive firms, as well as of the rise in consumers' ability to compare prices across firms, which increases within-industry competition, and overall enhances the efficiency of the market and the welfare of consumers. The literature has also documented a parallel rise in industry markups, suggesting that the rise in concentration has been at the expense of low-markup firms, which have been forced to exit the market or to reduce their market share, as well as to the benefit of high-markup firms, which have been able to increase their market share and their profits, and hence have driven an increase in average industry markups, to the detriment of consumer welfare (De Loecker et al., 2020; Loecker and Eeckhout, 2018).

As warned by Syverson (2019), while related, concentration and market power are not the same thing, and researchers should be careful not to conflate the two. Market power is a measure of the ability of a firm to set prices above marginal cost, and hence to extract rents from consumers, while concentration is a measure of the distribution of market shares across firms within an industry. The two are related, in that higher concentration is often associated with higher market power or low competition, but there are as well a large body of work that shows that concentration can be high in competitive markets, where the high levels of concentration are in fact *driven* by the high level of competition. Covarrubias et al. (2020) and Philippon (2019) take this argument by heart and further argue that the rise in concentration in the U.S. economy can be traced back to two different types of concentration: "good concentration", where concentration is driven by economic forces that enhance industry performance, and "bad concentration", where concentration is driven by rent-seeking behavior, such as lobbying and barriers to entry, that reduce industry performance and allow firms to increase their market power. They do not explicitely test for a link between the rise of bad concentration and some sort of interaction between firms and the government, such as lobbying or political contributions, but they do informally entertain the idea of lobbying as a channel through which firms can interact with the government to influence the regulatory environment to their benefit, as well as the institutional framework that oversees the enforcement of antitrust laws, entry barriers, and other regulations that affect the level of competition within an industry.

This chapter is a direct descendant of the Covarrubias et al. (2020) paper, with a special focus on the role of political contributions as a channel through which firms can interact with the government to influence the regulatory environment to their benefit, resulting in a rise in concentration that is driven by "bad concentration". I start with a similar theoretical model as the one presented by Covarrubias et al. (2020), and analyze the effect of increased competition on the level of concentration of the industry, and informally identify motives that could drive firms to lobby the government to modify the regulatory environment to their benefit, and what the effects of these changes would be on the level of concentration of the industry. I then proceed to test empirically a simple question: do political contributions affect market concentration? To do so, I leverage two main sources of data: the first is the Business Dynamics Statistics (BDS) from the U.S. Census Bureau, which provides information at the 3-digit NAICS level on the number of firms and employees for up to 10 different firm size categories, and stretches from 1977 to 2022. The second one is the OpenSecrets Bulk Campaign Finance Data, which provides virtually the universe of federal-level political campaign contributions from 1990 to 2018, and, crucially, includes the name of the donor, the name of the recipient, the industry if the donor is a firm, and the amount of the contribution (OpenSecrets, 2021).

I find that political contributions have a positive and significant effect on the level of concentration of the industry, measured by the share of employment of held by firms with more than 2500 employees, and that this effect is stronger in industries where total factor productivity and concentration are not positively correlated, suggesting that the rise in concentration is driven by "bad concentration", rather than by "good concentration". In order to establish causality, I leverage the dramatic increase in political contributions from ideological groups in the mid 2000s, and use this to instrument for the level of business-related political contributions, and find that a 1% increase in the share of an industry's political contributions to the total amount of political contributions in a U.S. federal election cycle leads to a 0.4 percentage point increase in the share of employment held by firms with more than 2500 employees, which cuases a reallocation of employment that depresses the middle of the firm size distribution, and increases the level of firm size dispersion within the industry, as well as the level of concentration of the industry.

## Chapter 3: Unleashing Potential: Foreign Workers and Direct Exports

Chapter 3 goes beyond the borders of the United States and explores the Vietnamese economy This chapter, co-authored with Léa Marchal and Claire Naiditch, studies the the role of foreign labor in shaping firms' export behaviors. As in the previous chapters, the analysis is grounded in a theoretical model that features firm heterogeneity, where firms differ in their level of productivity. In this chapter, features the presence of foreign workers in order to study how they influence firms' export decisions. In the model we present, firms have the option to export their goods through two channels: either directly, where they sell their goods to foreign consumers, or indirectly, where they sell their goods to a domestic intermediary, which then sells the goods to foreign consumers. Exporting directly entails higher fixed costs compared to exporting indirectly, which makes it more difficult for smaller firms to engage in direct exports, as they may not have the necessary resources to cover these costs. Nevertheless, conditional on being able to cover these costs, exporting directly is more profitable than exporting indirectly, as it allows firms to capture a large share of the profits from the sale of their goods to foreign consumers. The second channel, exporting indirectly, is less profitable than exporting directly, but it is also less risky. When firms export indirectly, they sell their goods to a trade intermediary, which then sells the goods to foreign consumers. This way, the intermediary takes on the costs and risks associated with setting up shop in a foreign country, such as the costs of setting up a distribution network, the costs of marketing the goods, and the costs of complying with foreign regulations. Firms who export directly are able to cover these costs themselves, while firms that export indirectly are not able to cover these costs, and hence rely on the intermediary to access foreign markets. Because of this, firms that export indirectly capture a smaller share of the profits from the sale of their goods to foreign consumers, as they have to share the profits with the intermediary. Firms in the model have then two main decisions to make: whether to export or not, and whether to export directly or indirectly. This setup is reminiscent of the analysis in Mrázová and Neary (2018), where the authors study the difference between first order and second order selection effects among heterogeneous firms. They show that an ample set of models can be transformed into a model with firm heterogeneity where firms that differ in their level of productivity have to take two decisions: whether to serve a market or not, which the authors call the first order selection effect, and how to serve the market, which the authors call the second order selection effects. Indeed, for the purposes of this chapter, the first order selection effect is whether to export or not, and the second order selection effect is whether to export directly or indirectly, and the presence of foreign workers is expected to influence both decisions if they have an effect on the firm's ability to cover the fixed costs associated with exporting directly and indirectly.

The empirical analysis in this chapter leverages the 2010 UNIDO Viet Nam Industry Investor Survey, which offers a cross-sectional, firm-level data encompassing employment, productivity, and export behaviors. Given that the choice of whether to export, and how to do so, are strategic decisions that firms make, we base our empirical analysis on the share of high-skilled foreign workers in the firm's workforce, and study how this share influences the firm's propensity to export, to export directly, and to export indirectly. As in the previous chapter, the empirical analysis is at risk of being plagued by endogeneity issues, as the presence of foreign workers may be correlated with unobservable firm characteristics that also influence firms' export decisions. To address this issue, our identification strategy leverages variation in the share of low-skilled foreign workers in each firm to instrument for the share of high-skilled foreign workers. We find that the effect is mostly concentrated on the sample of firms that are at the top end of the productivity distribution, where the presence of foreign workers is associated with a higher likelihood of exporting, and a higher likelihood of exporting directly. To alleviate concerns about the validity of the instrument, we conduct a series of robustness checks, including estimating different specifications of the model, and develop an alternative identification strategy altogether, where we apply the doubly robust estimator of Jonsson Funk et al. (2011) to estimate the effect of the share of high-skilled foreign workers on the firm's export decisions by propensity score weighting the firms in the sample based on their propensity to hire foreign workers, and continue to find a positive and significant effect of the share of high-skilled foreign workers on the firm's propensity to export, and to export directly.

Our results must be interpreted with caution, however, as the sample of firms represented in the survey is not representative of the whole population of firms in Viet Nam, but rather overrepresentative of larger firms, more export-prone firms. Hence, the results may not be generalizable to the whole population of firms in Viet Nam, but they do provide a first look at the potential effects of foreign workers on firms' export decisions, and suggest that the presence of foreign workers can be a catalyst for international trade. Given the importance of international trade for economic growth, and the well-documented financial constraints that firms face in developing economies, the results presented in this chapter suggest that the presence of foreign workers can be a potential avenue for firms to overcome these constraints, and to engage in international trade, which can be a key driver of economic growth in developing countries.

# Conclusion

This dissertation explores the role of firm heterogeneity in productivity playes in shaping economic outcomes, with a focus on market concentration, political influence, and international trade. Through a combination of theoretical modeling and empirical analysis, the three chapters shed light on the mechanisms at play and their implications for policy.

Chapter 1 developed a theoretical model that embeds a common agency lobbying game into a standard heterogeneous firms framework. The analysis yielded a sharp prediction: lobbying by special interest groups can have tangible effects on the firm size distribution and consumer welfare. By considering different cases of single and multi-lobby games, the model highlighted the importance of accounting for firm-level heterogeneity when studying the impact of political influence on economic outcomes. The results suggest that lobbying may be a contributing factor to the rise in market concentration and markups observed in recent decades.

Building on these theoretical insights, Chapter 2 empirically investigated the relationship between political contributions and industry concentration in the United States from 1990 to 2018. The findings provide evidence that rent-seeking behavior, in the form of political donations, is at least partially responsible for the increasing concentration in the U.S. economy. This work contributes to the growing literature on the causes and consequences of rising market power, and highlights the need for further research on the economic impact of money in politics and the role of lobbying in shaping industry structure and, ultimately, economic performance.

Chapter 3 shifted the focus to the role of skilled foreign workers and trade intermediaries in shaping firms' export decisions, particularly in the context of Viet Name, a developing economy. The chapter presented a model featuring heterogeneous firms, an intermediary sector, and foreign workers, which predicted that the presence of skilled foreign workers can help firms overcome productivity constraints and access foreign markets. Using data from the 2010 UNIDO Viet Nam Industry Investor Survey, the empirical analysis found support for the model's predictions, highlighting the potential for skilled foreign workers to generate positive aggregate externalities in trade-oriented developing economies.

The dissertation contributes to our understanding of how differences in firm productivity interact with policy, institutions, and globalization to shape industry structure, market power, and economic performance. The findings have important implications for policymakers seeking to promote competition, innovation, and inclusive growth in an increasingly complex and interconnected world, where the actions of individual firms can have far-reaching consequences for the broader economy. Indeed, there is a growing consensus, and a sense of urgency, that the rise of powerful individual firms, and the increasing concentration of economic activity in the hands of a few, poses a threat to the stability of the global economy and state of democracy, and that policymakers must act to curb the rise of these firms and to promote competition and innovation in the economy[1]. At the same time, the dissertation points to several avenues for future research. Extensions of the theoretical model in Chapter 1 could explore the long-run impact of lobbying on growth, inequality, and technological change. Empiri-

[1] See, for example, the following New Yorker article regarding Elon Musk's growing influence on the U.S. government https://www.newyorker.com/magazine/2023/08/28/elon-musks-shadow-rule.

cal work building on Chapter 2 could further quantify the economic impact of political contributions, particularly in terms of market power and welfare. And the analysis in Chapter 3 could be enriched by panel data allowing for a more detailed investigation of firms' export dynamics and the role of skilled foreign workers.

# Chapter 1

# Lobbying, Productivity and Market Concentration

## 1.1. Introduction

**Levels of industrial concentration in the American economy have increased remarkably in the last decades.** Different theoretical explanations have been proposed in recent years, although the literature has yet to arrive at a consensus (H. Hopenhayn et al., 2022; Covarrubias et al., 2020; Autor et al., 2020c). In parallel, both lobbying expenditures and campaign contributions have been on the rise starting in the 1990s, with a marked increase since the 2000s. This increase in political spending has been observed across a wide range of industries and has prompted legislative action, such as the Lobbying Disclosure Act of 1995, the Bipartisan Campaign Reform Act of 2002, and the Honest Leadership and Open Government Act of 2007. These legislative actions aimed to bring visibility to the interactions between politicians and Special Interest Groups (SIGs), as well as to limit the influence of money in politics, to varying degrees of success (Albert, 2017; Malbin, 2006; Conconi et al., 2020).

Firms and policymakers interact in a variety of ways, the two most common being

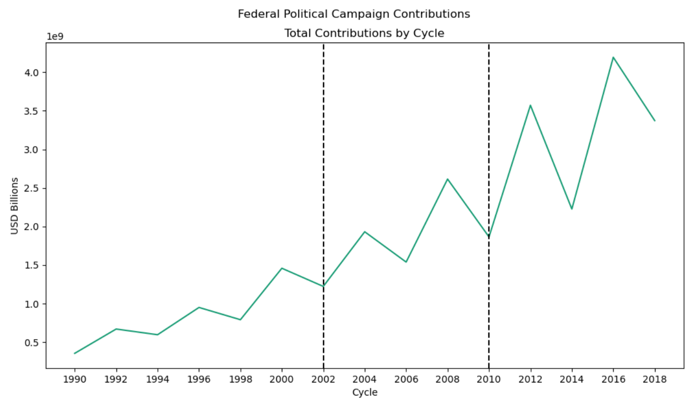



**Figure 1.1** – Total campaign contributions to federal campaigns in USD billions, 1990-2018. The dotted lines represent the passing of the Bipartisan Campaign Reform Act (BCRA) in 2002 and its subsequent partial repeal in 2010. Source: OpenSecrets (2021)

lobbying and campaign contributions. Lobbying is the act of attempting to influence the actions, policies, or decisions of officials in their daily life, most often legislators or members of regulatory agencies, through direct contact or through professional intermediaries, referred to as “lobbyists”. This activity is regulated in the US by the Lobbying Disclosure Act of 1995, which requires lobbyists to register with the House and Senate, and to file quarterly reports on their activities, and by the Honest Leadership and Open Government Act of 2007, which increased the transparency of lobbying activities and required lobbyists to disclose their activities[1].

Campaign contributions, on the other hand, are donations made to political candidates, political parties, or other political causes, regulated in the US by the Federal Election Commission (FEC) and usually done through Political Action Committees (PACs). The Bipartisan Campaign Reform Act (BCRA) of 2002, also known as the McCain-Feingold Act, limited the amount of money that could be donated to political campaigns. It came as a response to the increasing amount of so-called “soft money”, or indirect, donations,

[1]The House of Representatives’ Office of the Clerk maintains an up-to-date public document titled “Lobbying Disclosure Act Guidance” that provides a comprehensive overview of the rules and regulations regarding lobbying in the US, accessible at https://lobbyingdisclosure.house.gov/ldaguidance.pdf.

which were unregulated contributions to political parties used to fund party-building activities, such as voter registration drives and issue ads, and were not subject to the same contribution limits as "hard money", or direct, donations, which were contributions to specific candidates or campaigns. Following the Supreme Court's Citizens United vs FEC decision, in 2010, to partially repeal the BCRA, the amount of money spent on campaign contributions increased dramatically throughout the 2010s. This decision allowed for the creation of "Super PACs", PACs that can raise and spend unlimited amounts of money from corporations, unions, and individuals, as long as they do not coordinate with the candidates or campaigns they support (Albert, 2017; Malbin, 2006; Conconi et al., 2020). Figures 1.1 and 1.2 show the total amount of campaign contributions to federal campaigns (Figure 1.1) and the amount of direct and indirect contributions (Figure 1.2) from 1990 to 2018, as reported by the OpenSecrets, a non-profit, non-partisan research group that tracks lobbying and related activities in the US (OpenSecrets, 2021).

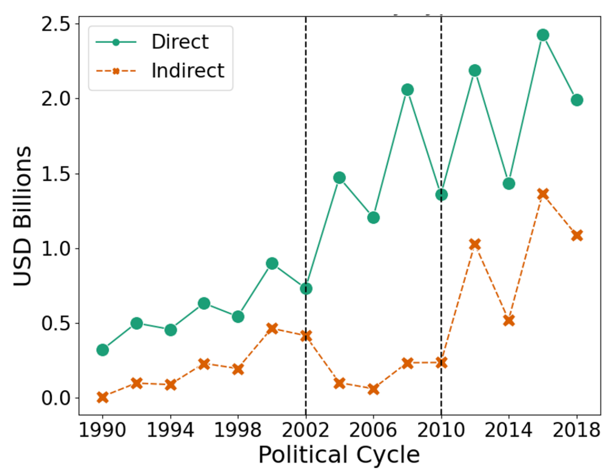



**Figure 1.2** – Total campaign contributions to federal campaigns, disaggregated by direct contributions and indirect contributions, 1990-2018. The passing of the BCRA of 2002 corresponds to the sharp decrease in the amount of indirect contributions, with the Citizens United v. FEC decision of 2010 corresponding to their subsequent sharp increase (OpenSecrets, 2021).

In this paper, I explore a mechanism through which a policymaker can exchange favors with Special Interest Groups (SIGs) within an industry. The interaction between the policymaker and SIGs can then influence the industry's level of concentration. This mechanism involves the enactment of policy that distorts the regulatory environment in which firms operate, a form of regulatory capture, and can result in a shift in the firm size distribution towards the right, increasing the level of concentration. I start from a standard model of monopolistic competition with heterogeneous firms, modified to include a common agency "lobbying" game between SIGs and a policymaker. In exchange for political donations from SIGs, the policymaker implements policies that shape the regulatory environment faced by firms, thus affecting the industry's competitive landscape. The regulatory environment is modeled as a vector of two policy instruments. The first is designed to increase the industry's fixed entry cost, paid on market entry, through mechanisms such as licensing requirements or extensive compliance checks, effectively acting as gatekeepers to new market entrants. The second policy instrument targets the increase of fixed operating costs, paid on a per-period basis, incorporating measures like annual licensing fees, environmental compliance costs, or mandatory employee training programs.

These regulatory measures, each with an exogenous baseline component determined by the specific nature of each industry, are what I refer to as the industry's fixed "entry" and "operating" costs. I focus exclusively on scenarios where the policy instruments are only increased. Such an approach reflects a deliberate choice to heighten entry barriers and operational challenges through regulatory means. Without the presence of production externalities or other market failures justifying these regulatory interventions, the optimal policy is that of a laissez-faire regulatory environment, where the entry and operating costs are set at their baseline levels, $\tau_e = \tau_o = 1$, a result that directly follows from the efficiency of monopolistic competition under CES preferences (Dixit and Stiglitz, 1977; Dhingra and Morrow, 2019). This framework captures how the policymaker's decisions, swayed by lobbying, influence firm behavior and the competitive structure of the industry.

I use an arbitraty firm's profit function and the economy's equilibrium conditions as a guide to identify different incentives to lobby (i.e., different desired policy outcomes) among firms of different sizes, in line with the observation that firm heterogeneity gives rise to competing SIGs even within the same narrowly-defined industry. Firms with similar policy objectives form a lobby, two in the most general case considered, and lobby the policymaker to implement policy that advances their agenda. The interaction between the lobbies and the policymaker is modelled as a common agency problem in the spirit of the "Protection for Sale" model from Grossman and Helpman (1994) (GH), where the policymaker is the agent and the lobbies are the principals. The policymaker's objective is to maximize the weighted sum of consumer and SIGs' welfare, where the weight is a measure of the policymaker's selflessness. Each lobby's objective is to maximize the aggregate welfare of its members.

I use the game's Truthful Nash Equilibrium (TNE) (Bernheim and Whinston, 1986; Dixit et al., 1997) to derive a relationship between lobbying composition (which of the identified camps partake in the game), lobbying behaviour (the amount of political contributions) and the underlying market structure (the level of competition in the industry). I identify two distinct camps of firms: one composed of low productivity firms and the other composed of high productivity firms. In between these two camps I uncover a key quantity, the threshold that separates low productivity firms, concerned more about their own costs, from high productivity firms, concerned more about aggregate market conditions. Each camp of firms represents a distinct "type" of real-world SIG. The lobby for low productivity firms is an abstraction for an industry-wide organization that represents the interests of a large number of small establishments with similar political goals. The lobby for high productivity firms is an abstraction for a single (or small amount of) big industry player(s) that lobby individually. In line with the literature, I find that in less concentrated, more competitive industries there is a larger incentive for low productivity firms to lobby together, while the inverse is true for high productivity firms that lobby individually.

I consider three cases of the game and derive the equilibrium policy in each case. In the first case considered, a single participating lobby, representing low productivity firms, attempts to erect barriers to entry that prevent the entry of new, potentially innovative firms. This allows for the survival of low productivity firms, that would otherwise be forced to exit, and decreases both the industry's average productivity and competition level. A classic example of this type of lobbying is the taxi market, ubiquitous in urban environments around the world. The supply of taxi licences is highly regulated in a large number of urban areas, most notably New York City. Focusing on this case, a political economy model of the persistence of taxi medallions suggests that an industry wide lobby manages to sustain an artificially high barrier to entry by applying political pressure on policymakers (Wyman, 2013). Before the advent of ride-sharing apps, taxi technology was largely similar, corresponding to the case where the elasticity of substitution $\sigma$ is extremely high, implying a highly competitive, ex-ante environment with a large number of taxis competing for the same pool of consumers. Following the game, the lobby for low productivity firms ($LP$) is able to extract positive rents for its members by coordinating incumbent firms to lobby for an increase in the entry fee, which shifts the cutoff productivity level to the left, which eases competition and allows for the survival of low productivity taxis, conditional on paying the entry fee. [2]. More broadly, the single lobby case with a lobby representing low productivity firms is an abstraction that has as an empirical counterpart the documented correlation between industry competition and lobbying through trade associations. The literature has shown that sectors with more elastic demand curves are more likely to lobby for sector-wide protection, as opposed to lobbying for product-specific protection, a practice more common in

[2]In practice, they lobby for a fixed, highly constrained, supply of taxi licences which in turn raises the price of the licence. This is akin to lobbying for a higher entry cost in the model, as the cost of entry is the price of the licence.

sectors with less elastic demand curves where firms are more likely to be able to raise profits through higher markups (Bombardini and Trebbi, 2012).

In the second case, a single participating lobby, representing high productivity firms, lobbies for a more difficult-to-operate-in environment, captured as higher operating costs, that forces low productivity firms to exit, and increases the level of concentration in the industry. This case can be regarded as an abstraction for single, high productivity firms lobbying individually for regulation that while favoring their own interests, is detrimental to the industry as a whole, with the intention of capturing as much of the market as possible. As a real-world example, the American aviation industry experienced a deregulation episode in the late 20th century that reduced regulatory overhead, resulting in a decrease in average price-per-mile flown, an increase in the number of airlines operating in the market, and an overall improvement in consumer welfare, implying that a sizable portion of regulation in place was benefitting airlines and not consumers (Philippon, 2019).

In both cases where there is a single participating lobby, I find that, without an opposing lobby with a credible threat of entering the game, either lobby is able to capture positive rents. Since the policymaker's objective is to maximize a weighted sum of consumer and SIGs' welfare, the lobby contributes enough to guarantee that the policymaker's welfare is not lower than the baseline case where no lobbying takes place. Hence, the lobby pays the policymaker to "not have a conscience". In both cases the effect on consumer welfare is unambiguously negative. The effect on the firm size distribution is also unambiguous, albeit different in each case. In the first case, the entry cost is set at a higher than optimal level, resulting in barriers to entry that lower the level of competition and allow for the survival of low productivity firms that would otherwise be forced to exit, causing a misallocation of labor towards less productive firms, which decreases the industry's average productivity and concentration level. In the second case, the operating cost is set at a higher than optimal level, so that low productivity firms are forced to exit, making the industry more concentrated and productive, at the expense of product variety and consumer welfare.

The third case considered deals with the two lobbies competing with each other. In this case, the equilibrium policy turns out to be unchanged from the baseline case. Nevertheless, the policy maker successfully extracts rents from both lobbies by exploiting the credible threat of only serving the interests of the opposing lobby. Since the baseline policy is optimal, the effect on consumer welfare is null. This last case sheds light on the puzzlingly low weight empirical studies suggest policymakers give to political donations, since not considering the opposing lobby would naturally yield an excessively high weight to consumer welfare in an empirical analysis (Gawande and Bandyopadhyay, 2000a; Ansolabehere et al., 2003). The last result, where both lobbies perfectly offset each other's influence on the policymaker's, implies a perfectly level political playing field, which in practice is unlikely to occur, as the literature on lobbying suggests that there are significant barriers to entry into lobbying, and that lobbying is a persistent activity, both in the extensive and intensive margins (Huneeus and Kim, 2021).

Nevertheless, the model's results, when contextualized within recent empirical evidence on the increase in concentration and average industry markups in the US economy, suggest that the mechanism proposed in this paper could have a non-negligible effect on the american economy, in particular, on the level of industry concentration and productivity.

**Related Literature.** This paper contributes to two strands of research: the political economy of lobbying and the macroeconomic analysis of market power and concentration. The effect of regulatory capture on market structure and the recent increase in industrial concentration in the US economy has been discussed in the macroeconomic literature on market power before, most notably in Covarrubias et al. (2020), Philippon (2019), and Gutierrez and Philippon (2022), but the political mechanism through which this occurs has not yet been explored in depth, which is the main contribution of this paper. On the other hand, embeding a political mechanism in a model of firm heterogeneity has been previously explored in the context of international trade policy, as in Bombardini (2008), Abel-Koch (2013), and Rebeyrol and Vauday (2008), although without considering the effect of lobbying on the industry's level of concentration. This paper hence fills a gap in the literature by providing a political economy model of the effect of lobbying on the level of market concentration in an economy with firm heterogeneity and monopolistic competition.

Political economy has a long tradition in studying the interaction between politicians and SIGs, in particular, as mentioned, in the context of international trade policy. The Grossman-Helpman (GH) "Protection for Sale" model of lobbying provided a convenient framework to study the interactions between politicians and SIGs that endogenously give rise to trade policy. This framework, rapidly extended by Dixit et al. (1997) to the general case of policy-making, has since been extended to tackle a variety of related cases given its early empirical support. It has also popularized the use of political contributions data in empirical lobbying research (Gawande and Bandyopadhyay, 2000a). In contrast to this model with firm heterogeneity, the GH model assumes a single SIG that lobbies for a whole, homogenous industry.

Assessing the effects of lobbying can be a nuanced task. As remarked by Bombardini and Trebbi (2020), quantifying a firm's payoff after lobbying is a highly complex issue, given the natural nontransparency of the lobbying endeavor. They review distinct empirical strategies to identify the demand of policy, on the part of interest groups, and the supply of policy, on the part of the policymaker. Conconi et al. (2020) provide detailed firm-level data from the US, revealing that the majority of lobbying related to Free Trade Agreements (FTAs) is undertaken by large firms. These firms lobby ten times more than industry groups and fifty times more than unions. Their findings highlight several key facts: virtually all lobbying firms favor FTAs, larger and more internationalized firms are more likely to lobby on FTAs, and firms intensify their lobbying efforts on agreements that promise larger profit gains or when US legislators are less inclined towards ratification. This empirical evidence highlights the strategic behavior of firms in influencing trade policy, aligning with our analysis of the single, high productivity lobby game where the potential gains from lobbying efforts outweigh the possible industry-wide losses.

Bombardini (2008) presents evidence that industry characteristics, in particular the level of firm productivity dispersion, is positively correlated with that industry's level of protection. This paper, however, does not consider the effect of lobbying on the firm size distribution, but rather focuses on the effect of firm heterogeneity on lobbying behaviour and how it affects policy outcomes, a topic that is also addressed in this paper.

In a related paper, Bombardini and Trebbi (2012) ask why some firms lobby together and why some firms lobby by themselves. Their framework allows domestic producers to choose between lobbying for sector-wide tariffs or product-specific protections in an oligopolistic market. Their results show that sectors with greater product market competition and lower levels of concentration are more inclined to engage in collective lobbying through trade associations for sector-wide protection,while sectors with higher levels of concentration and lower product market competition are more inclined to lobby individually for product-specific protection. This distinction and their findings are similar to the setup in this paper, where low productivity firms lobby for barriers to entry, an industry-wide policy, while high productivity firms lobby for a more difficult-to-operate-in environment, which while not explicitly product-specific, is a policy that affects individual firms differently.

Huneeus and Kim (2021) focus on the misallocation of resources that results from lobbying. They start from a baseline model of monopolistic competition with heterogenous firms and extend it with the GH framework. While they focus on a single industry, their results are consistent with ours regarding the effect of lobbying on the firm size distribution for the case of a single, high productivity lobby, highlighting the importance of a lowered entry cost in increasing the level of competition and welfare in the industry. They document several empirical regularities, presented as stylized facts, regarding lobbying expenditures. They find that lobbying is persistent over time in the extensive margine, where firms that self-select into lobbying continue to do so, as well as in the intensive margine, where do not shift their lobbying expenditures significantly once they start lobbying. They document that entry into lobbying is associated with bigger firms, albeit not lobbying expenditures, which they interpret as a sign of barriers to entry into lobbying. Finally, they also document that lobbying is far from a universal activity, with only a small fraction of the firms in their dataset, comprised American publicly traded firms, engaging in lobbying.

Similarly, Maggi and Ossa (2023) delve into the differentiation between product and process standards in their lobbying model, considering the implications for international cooperation and lobby competition. These studies underscore scenarios where firms target distinct types of regulation, paralleling the dual regulatory focus in our analysis derived from the Melitz model.

The literature on the political economy of trade policy has also explored the role of lobbying in shaping the formation of Non-Tariff Barriers (NTBs). Abel-Koch (2013) explores the impact of trade policies within a monopolistic competition model, focusing on a single SIG in a small open economy and primarily addressing fixed operating costs without delving into entry barriers or considering multiple lobbies. This singular focus contrasts with our broader approach, which encompasses both fixed operating and entry costs, thereby introducing competition within the domestic market based on barriers to entry and analyzing the lobbying efforts of both high and low productivity firms. Unlike Abel-Koch, our model does not focus the analysis to trade implications but studies to the regulatory impacts on the domestic economy. Rebeyrol and Vauday (2008) investigate the formation of Non Tariff Barriers (NTBs) from the perspective of intra-industry competition between SIGs in a closed economy, yet their analysis does not extend to the policymaker's influence on sunk entry costs. Our work diverges by incorporating the policymaker's role in adjusting both operating and entry costs, thereby allowing an exploration of lobbying objectives across a spectrum of firm productivities and providing a closed-form expression for the welfare implications of both of these regulatory measures, aspects not addressed by Rebeyrol and Vauday.

Plouffe (2023) questions the traditional political economy approach of focusing on export propensity at the industry level. He points out that engaging in trade is inherently a firm-level activity and notes that while higly productive firms benefit from access to foreign markets, unproductive firms may be harmed by competition from foreign producers, deducing that different productivity levels in the same industry imply different target policies. He finds that it is mostly highly productive firms that export who mostly lobby, and do so in favor of trade liberalization, and highlights the importance of entry barriers to lobbying. Regarding opposing lobbies competing for policy outcomes, Egerod and Junk (2022) explore this issue empirically and indeed find evidence of zero-sum-like behaviour.

Introducing agent heterogeneity has become a standard approach in macroeconomics and international trade. The seminal work of Melitz (2003a) introduced firm heterogeneity to explain resource reallocation following trade liberalization. A literature has since arised studying policy in many versions of this model. Examples include trade policy in a small open economy ("Trade policy under firm-level heterogeneity in a small economy" 2009), optimal fixed-cost subsidies both autarky and an open economy (Jung, 2012), and optimal trade policyCostinot et al. (2020) in a very general setting. All of these studies are absent political mechanisms, our main contribution to this literature.

As Dixit and Stiglitz (1977) demonstrated, in a market with constant elasticity of substitution among identical firms, the market equilibrium coincides with the constrained optimum, even in the absence of lump-sum transfers to firms. Furthermore, Dhingra and Morrow (2019) extended this analysis to a setting with heterogeneous firm productivity and free entry, showing that the market still achieves efficient allocations across variety, quantity, and productivity under CES demand. This efficiency underpins the fact that in our baseline economy, the laissez-faire policy $\tau_o = \tau_e = 1$ is optimal, provided the regulatory environment does not impose additional burdens on entry or operation costs. Consequently, the regulatory policy is constrained to not decrease the fixed costs associated with market entry and operation, reinforcing the principle that $\tau_o, \tau_e \geq 1$, thereby ensuring that the focus is exclusively on regulatory burden.

A consequential offshoot of this approach is the emergence of the "Macroeconomic Market Power" literature, where firm heterogeneity facilitates the exploration of industry-level concentration and market power from a macroeconomic perspective. Syverson (2019) provides a comprehensive review, cautioning against simplistic comparisons between concentration and market power. Emphasizing the importance of distinguishing between the two, the author highlights the potential pitfalls of relying solely on concentration as a proxy for market power. This paper's analysis contributes to this discourse by illustrating how lobbying for regulatory changes can shift market *shares*, potentially leading to variations in market *power*. In line with the findings of Covarrubias et al. (2020) and Philippon (2019), this paper acknowledges the dual nature of concentration. There is "good" concentration, which arises from innovation and efficient market dynamics, and "bad" concentration, stemming from artificial barriers to competition, such as those erected through political lobbying. While the 1990s saw concentration driven largely by positive market forces, this paper is more reflective of the post-2000s scenario where regulatory manipulation plays a significant role. Recent literature, including works by Autor et al. (2023) and Rossi-Hansberg et al. (2020), has highlighted the contrasting trends in local versus national concentration. I complement these studies by providing a theoretical framework to understand how national policies, influenced by lobbying at the industry level, can have varying impacts on local and national market structures.

# 1.2. Theory

## 1.2.1 Baseline Economy

**Overview** The baseline economy is a modified version of the Melitz (2003a) closed economy with Pareto-distributed productivity, that includes two policy instruments related to the industry's fixed costs, which capture the notion of "regulatory overhead" and of "barriers to entry" in this industry. The policymaker's objective function is modified to include both consumer welfare and political contributions, which allows us to introduce a lobbying game between SIGs and the policymaker. I briefly describe the baseline economy, and then proceed to illustrate the incentives to lobby in this economy. For a full description of the model, see Appendix 1.A.

In this version of the model, the economy's two fixed costs, the per-period operating cost $f_o$ and the entry cost $f_e$, are influenced by distinct policy instruments, denoted by $\tau_f$ and $\tau_e$ respectively. These policy instruments reflect the regulatory framework impacting firms within the economy. Specifically, $\tau_e$ represents a policy instrument that increases the cost of market entry for potential entrepreneurs, exemplified by regulations such as licensing requirements, or extensive compliance checks, which collectively act to gatekeep new market entrants. Conversely, $\tau_f$ encapsulates policies that escalate operating costs for all firms, embodying regulatory burdens like annual licensing fees, environmental compliance costs, or mandatory employee training programs. Such measures, while designed to ensure firms adhere to industry standards and best practices, inadvertently increase the ongoing operational expenses. Through these instruments, the model captures the nuanced ways in which regulatory policies can both deter market entry and elevate the operational hurdles faced by firms, thereby affecting the economic landscape in which these entities operate.

In the baseline economy, the policymaker's objective is to maximize consumer welfare, which yields as optimal policy $\tau_f = \tau_e = 1$ - no regulation, a laissez-faire policy that allows the economy to operate at its most efficient level. The efficiency of this policy is a direct consequence of the efficiency of monopolistic competition under CES preferences, in both the case of identical firms as well as the case of heterogeneous firms (Dixit and Stiglitz, 1977; Dhingra and Morrow, 2019). While it is true that regulation can be welfare-enhancing in the presence of market failures, the baseline economy is designed to capture the effect of regulatory capture, where the regulatory framework is shaped to the benefit of incumbent firms, to the detriment of consumer welfare. Indeed, I do not consider the possibility of market failures in this economy, as our focus is on the effect of regulatory capture on the economy's structure and performance.

In this setting, there is an incentive for some firms to lobby the policymaker to set $\tau_f$ and $\tau_e$ to a value different from one, in order to erect barriers to entry that protects them from competition or allow them to drive out competitors[3].

**Baseline Equilibrium** A representative consumer has Dixit-Stiglitz preferences with elasticity of substitution $\sigma$. She supplies labor inelastically and consumes a composite good that is a CES aggregate of all varieties produced by incumbent firms. Firms in this economy are monopolistically competitive, set prices to maximize profits given the consumer's demand curves, have idiosyncratic productivity $z$ and produce a differentiated good. Time is discrete, and, order to focus on the steady state, I drop the time subscript from all variables. Firms face a per-period, constant, hazard rate of exit $\delta$, as well as effective operating cost $f_o\tau_o$ and a sunk entry cost $f_e\tau_e$. Each period, a share $\delta$ of firms exit the market, and are replace by successful new entrants. Entrants pay the

[3]Our choice of policy instruments is also motivated by recent research on rising entry costs and its implications for concentration. Using the model's fixed costs with associated policy instruments effectively implies that lobbying firms actively shape to their benefit the regulatory framework they face, a type of regulatory capture (Gutiérrez et al., 2019).

sunk entry cost $f_e \tau_e$ before drawing their productivity level from a Pareto distribution with cumulative distribution function $H(z) = 1-(z)^{-\alpha}$, where $z$ is the productivity level and $\alpha$ is referred to as the "shape parameter". The shape parameter of a Pareto distribution is a measure of the distribution's "fat-tailedness", and is a key determinant of the economy's structure and performance. More specifically, the lower the $\alpha$ parameter, the more dispersed the productivity distribution, and the more concentrated the firm size distribution (Gabaix, 2016). I assume that the shape parameter $\alpha$ is larger than $\sigma - 1$ to guarantee the existence of the baseline equilibrium. Those entrants that are sufficiently productive to cover their operating costs and make non-negative profits remain in the market, while the rest exit. This process ensures that the mass of incumbent firms $M$ is constant over time, and that the distribution of productivities $g(z)$ is stationary.

The presence of fixed entry and operating costs, plus free entry and exit, imply two equilibrium conditions: a zero-profit condition (equation 1.11 in the Appendix) and a free-entry condition (equation 1.12 in the Appendix). The first condition ensures that the least productive firms that remain in operation make zero profits, and links average productivity to associated low cutoff productivity $z^*$ at which this condition holds. The second condition ensures that the expected profits of a potential entrant are non-negative, conditional on firms' productivity level, so that expected profits before drawing a productivity level, net of the sunk entry cost, are zero. Together, these conditions determine the equilibrium cutoff productivity $z^*$, which is the lowest productivity level at which firms can cover their operating costs and make non-negative profits. The economy's equilibrium is characterized by this cutoff productivity level, a mass of incumbent firms $M$, and a stationary distribution of productivities $g(z)$. It can be shown that the stationary distribution of productivities is also Pareto, with the same shape parameter $\alpha$ as the entry distribution, although shifted to the right by the cutoff productivity level $z^*$ and normalized to integrate to one over the interval $[z^*, \infty)$. Pareto distributed productivity implies the folowing closed-form expressions for $M$, $g(z)$, and

$z^*$:

$$M = \frac{(\alpha + 1 - \sigma)N}{\alpha\sigma\tau_o f_o} \tag{1.1}$$

$$g(z) = \frac{\alpha}{z^{\alpha+1}}(z^*)^\alpha \tag{1.2}$$

$$z^* = k_0\left(\frac{\tau_o}{\tau_e}\right)^{1/\alpha} \tag{1.3}$$

where $N$ is the economy's labor force, $\sigma$ is the elasticity of substitution between goods, $\alpha$ is the shape parameter of the Pareto distribution, $\delta$ is the exit rate, and $k_0 = \left[\frac{f_o(\sigma-1)}{\delta f_e(\alpha+1-\sigma)}\right]^{1/\alpha} > 0$ is a constant to ease notation. Welfare in this economy, computed as the purchasing power of a single wage compared to the equilibrium price index, is given by the following expression:

$$W = k_0\left(\frac{\sigma - 1}{\sigma}\right)\left[\frac{N}{\sigma f_o}\right]^{1/(\sigma-1)}\left(\frac{1}{\tau_e \tau_o^{\frac{\alpha-(\sigma-1)}{\sigma-1}}}\right)^{1/\alpha} \tag{1.4}$$

It can readily be see from equation ~ 1.4 that $\tau_o = \tau_e = 1$ is the optimal policy. This finding aligns with the established efficiency of monopolistic competition under CES preferences, in both the case of identical firms as well as the case of heterogeneous firms (Dixit and Stiglitz, 1977; Dhingra and Morrow, 2019) [4].

### 1.2.2 Special Interests Along the Productivity Distribution

Firms in this economy are faced with two types of fixed costs: the per-period operating cost $f_o$ and the sunk entry cost $f_e$. The policymaker can influence these costs through policy instruments $\tau_o$ and $\tau_e$, respectively. As mentioned above, these policy instruments capture in a tractable way the regulatory framework's effect on firms' behaviour

[4] Recall that the set of policy instruments is bounded below by one, $\tau_o, \tau_e \geq 1$.

and are the main object of lobbying in this economy.

**Lobbying for Regulatory Overhead.** Lobbying for an increase in $\tau_o$ is a subtle affair. There is no obvious protectionist advantage to be gained from increasing $\tau_o$, as it eats into firms' profits[5]. Indeed, raising $\tau_o$ has a direct negative effect on firms' profit, as it increases their per-period operating costs and forces the least productive firms to exit, while at the same time raising both the price index and average productivity. A higher price index implies that consumers are worse off, and induces a substitution effect that increases firm-level demand. For a big enough firm, this substitution effect and the increase in demand more than offsets the profit loss from the increase in operating costs, resulting in a net positive effect on profits. This suggests competing incentives for modifying the policy vector associated with the operating cost, depending on firm productivity [6].

In Appendix 1.A.2, this argument is formalized and I show that if a threshold productivity level $z_H$ exists such that firms with higher productivity $(z > z_H)$ benefit from an increase in operating costs, this threshold is endogenous and depends on the elasticity of substitution $\sigma$, as well as on the *low-cutoff productivity's elasticity* with respect to $\tau_o$, $\epsilon^{z^*}_{\tau_o}$. In particular, if $z_H$ exists, then $\epsilon^{z^*}_{\tau_o}(\sigma - 1) < 1$.

The case where $z_H$ exists, $\epsilon^{z^*}_{\tau_o}(\sigma - 1) < 1$, allows us to distinguish between two lobbying types. A lobby for highly productive, big firms is an abstraction for a single (or small amount of) big industry player(s) that lobby individually for regulatory goals aimed at increasing their market share. The lobby for low productivity, small firms is an abstraction for an industry-wide organization that represents the interests of a large number of small establishments with similar political goals. This dichotomy within a single industry rationalizes the empirical observation that lobbying is not a monolithic activity, but rather a heterogeneous one, and that lobbying in less concentrated, more competitive

[5]See section 1.A.1 in the Appendix for firms' labor demand and profit functions.
[6]This mechanism is also explored in Rebeyrol and Vauday (2008) and Abel-Koch (2013).

industries is more likely to be done through industry-wide associations, while lobbying individually is mostly profitable and observed in more concentrated industries (Bombardini and Trebbi, 2012). Equation 1.16 in the Appendix formalizes this intuition:

$$\frac{r(z_H)}{r(z^*)} = \frac{1}{1 - \frac{\sigma-1}{\alpha}}$$

And links the revenue ratio between a firm with productivity $z_H$ and a firm with productivity $z^*$ to the ratio $\frac{\alpha}{\sigma-1}$, the shape parameter of the firm size distribution[7] The shape parameter in Pareto distributions, and more generally the Power Law (PL) exponent in Power Law distributions, quantifies the level of inequality between the low and top quantiles of the distribution - a measure of concentration at the top (Gabaix, 2016). As $\frac{\alpha}{\sigma-1}$ gets closer to one and the firm revenue distribution becomes more concentrated at the top, the incentive for the top firm(s) to lobby individually increases. On the other hand, as $\frac{\alpha}{\sigma-1}$ goes away from 1, the distribution becomes less concentrated at the top, the share of firms that have a similar policy goal increases, and the incentive to lobby through a trade-wide association becomes dominant.

The case where $z_H$ does not exist, $\epsilon^{z^*}_{\tau_o}(\sigma - 1) \geq 1$, is not possible in our model because of the assumption of Pareto-distributed productivities, but it is still interesting to consider informally[8]. Intuitively, firms operating in industries with high $\sigma$ or high $\epsilon^{z^*}_{\tau_o}$ operate in a more competitive environment. High $\sigma$ implies that consumers are more willing to substitute between goods, while high $\epsilon^{z^*}_{\tau_o}$ implies that the low-cutoff productivity $z^*$ is more sensitive to changes in $\tau_o$. In both cases, firms are more sensitive to changes in their productivity, while at the same time, there is not enough *dispersion* among firms' productivities for there to exist a firm with high enough productivity in

[7]The shape parameter of the firm size distribution, not the productivity distribution. The endogenous distribution of active firms is $G(z) = 1 - (z/z^*)^{-\alpha}$. That plus the definition of $r(z)$ is sufficient to show that the cdf for $r$ is also Pareto with shape parameter $\frac{\alpha}{\sigma-1}$, as claimed.

[8]Since this analysis is comes directly from the profit function, it is valid for any distribution of productivities. The assumption of Pareto-distributed productivities is only used to derive the expressions for $z^*$ and $g(z)$.

order to offset the negative effect of an increase in operating costs[9]. Firms in this hypothetical example are too similar to each other and hence have a strong incentive to lobby together for shared regulatory goals, which consist solely of erecting barriers to entry[10].

**Lobbying for Barriers to Entry.** Increasing $\tau_e$, on the other hand, has a direct protectionist effect by shielding incumbents from potential entrants. I can see from equation 1.3 that the cutoff productivity level $z^*$ is decreasing in $\tau_e$, hence an increase in $\tau_e$ allows firms that would otherwise exit to remain in operation, so-called "zombies", which divert profits from more productive firms and depress aggregate productivity, similar to those studied in Caballero et al. (2008) in the context of the Japanese economy.

While the probability of exiting $\delta$ is unaffected by $\tau_e$, there is an indirect effect on the exit rate that allows firms with otherwise unprofitable productivity levels to remain in operation. Any exogenous, industry-wide positive productivity shock would increase $z^*$, precipitating the exit for firms with productivity levels below the new $z^*$, a type of resource misallocation that depresses aggregate productivity. Firms at the lower end of the productivity distribution have an incentive to lobby together for increased barriers to entry, as it would allow them to remain in operation despite their low productivity. This suggests that the lobby for increased barriers to entry is an abstraction for an industry-wide organization that represents the interests of a large number of small establishments with similar political goals. Empirical evidence in selected U.S. industries supports this interpretation (Philippon, 2019; Decker et al., 2016; Huneeus and Kim, 2021).

Contrary to what might be expected, not all firms uniformly support increasing $\tau_e$,

[9]This is the reason why the case where $z_H$ does not exist is not possible in our model, since the Pareto distribution is too "fat-tailed" to allow for a high enough $\epsilon_{\tau_o}^{z^*}$.

[10]This result is consistent with the empirical evidence presented in Bombardini and Trebbi (2012), who find that lobbying together is more prevalent in industries with high concentration.

despite the profit function of a firm with productivity $z$ increasing in $\tau_e$ across all productivity levels. This apparent paradox arises because, while individual firm profits may increase with higher $\tau_e$, aggregate profits for firms with productivity above the $z_H$ threshold actually decline. This can be shown by integrating the profit function across different productivity levels, comparing the aggregate outcomes for lower and higher productivity firms:

$$\Pi_{LP}(\tau) = \frac{(\alpha+1-\sigma)N}{\sigma}\left[\frac{\sigma-1}{\alpha(\alpha+1-\sigma)} + \frac{1}{\alpha}\left(\frac{z^*}{z_H}\right)^{\alpha} - \frac{1}{\alpha-(\sigma-1)}\left(\frac{z^*}{z_H}\right)^{\alpha-(\sigma-1)}\right]$$

$$\Pi_{HP}(\tau) = \frac{(\alpha+1-\sigma)N}{\sigma}\left[\frac{1}{\alpha-(\sigma-1)}\left(\frac{z^*}{z_H}\right)^{\alpha-(\sigma-1)} - \frac{1}{\alpha}\left(\frac{z^*}{z_H}\right)^{\alpha}\right]$$

This analysis reveals the lobbying game to be zero-sum, where the benefits accrued by high productivity firms from higher barriers to entry are offset by the decrease in the density of firms with productivity levels above the $z_H$ threshold. While firm-level profits are increasing in $\tau_e$ at all productivity levels, the effect of a higher $\tau_e$ on aggregate profits is negative for firms with productivity $z > z_H$ because more firms enter the market and compete for the same pool of consumers, so that, on aggregate, the density shifts to the left, in effect reducing aggregate profits for firms with productivity $z > z_H$. Since the lobby objective is to maximize aggregate profits, the lobby for high productivity firms ($HP$) has an incentive to lobby against an increase in $\tau_e$, otherwise aggregate profits $\Pi_{HP}(\tau)$ would decrease. The interplay of these opposing forces shapes the landscape of industry lobbying, highlighting a division based on firm productivity.

### 1.2.3 The Lobbying Game

#### Overview

**Lobby Membership.** We use the previous discussion to define two lobbies, one for high productivity firms ("HP") and one for low productivity firms ("LP"):

$$LP = \{z \mid z \in [z^*, z_H)\}$$

$$HP = \{z \mid z \in (z_H, \infty)\}$$

Each lobby $j \in J = \{LP, HP\}$ has an associated welfare function $U_j[\tau, C_j]$ that depends on the policy instrument and the amount of political contributions $C_j$, decreasing in the latter. Political contributions $C_j$ take the form of contribution schedules $C_j(\tau)$, a map from every policy instrument $\tau$ to a non-negative political contribution. For simplicity, we assume an upper bound on the amount of contributions $C_j(\tau)$ that each lobby can make, $C_j(\tau) \leq \overline{C}_j$. The set of all feasible contribution schedules is denoted by $\mathscr{C}_j$. We consider the upper bound $\overline{C}_j$ to be small enough that the economy's aggregates are not affected by the amount of contributions, but large enough so that lobbies can influence the policymaker's decision. As is standard in the literature, we assume that the free-rider problem is overcome - and hence we focus on the case where firms are able to coordinate their lobbying efforts and contribute to the lobby's political contributions, without explicitly modeling the coordination mechanism nor the firm-level contribution decision (Grossman and Helpman, 1994).

This is, in particular, needed to avoid the issue of lobbying firms foreseeing the policy instrument and contribution schedule that will be chosen in the future, and hence the issue of time-strategic behavior. We assume that the low-productivity lobby $LP$ is an abstraction for an industry-wide organization that represents the interests of a large number of small establishments with similar political goals, and hence is able to coordinate its members' contributions. In practice, as we mentioned in the introduction, most lobbying is done not through industry-wide associations, but through individual firms, which would correspond to the high-productivity lobby $HP$ (Huneeus and Kim, 2021). Nevertheless, the model is still useful to understand the incentives of different types of firms to lobby for different regulatory goals, and the implications of these incentives on the industry's structure and performance, and hence we proceed with the analysis. Finally, firms engage in the lobbying game only if they are active in the economy, i.e. once they have entered the market and are operating. Hence, lobbying does not feature in the entry decision, and entrants are not able to lobby until they have entered the market and are active.

**The Policymaker.** The policy instruments are chosen by a non-benevolent policymaker that maximizes a weighted sum of consumer welfare $W$ and political contributions. The policymaker's objective function is

$$G(\tau, \boldsymbol{C}) = aW(\tau) + \sum_{j \in J} C_j \tag{1.5}$$

where $a$ captures the relative weight assigned by the policymaker to its main role as welfare maximizer. Feasible policies $\tau \in \mathscr{T}$ are such that an industry equilibrium is achievable ( see Appendix 1.A).

**The Game.** The lobbying game takes the following form:

i Each lobby $j$ presents a contribution schedule $C_j$ to the policymaker.

ii The policymaker chooses a policy instrument ($\tau$) and collects contributions from each lobby.

The game is repeated every period, and every period the policymaker chooses a policy instrument and collects contributions from each lobby. As with the baseline economy, we focus on the steady state, and hence drop the time subscript from all variables. Each lobby keeps presenting their contribution schedule as long as the policymaker accepts them. If, in a particular period, any lobby decides to present a zero contribution schedule, the policymaker will optimize accordingly and the game will either become a traditional principal-agent game, if one lobby keeps its own contribution schedule in place, or the policymaker will revert to its ex-ante status and set the policy instrument back to $\tau = (1, 1)$ if no lobby participates. Given the lack of intertemporal optimization from firms, the game is effectively a one-shot game which is repeated every period without any intertemporal strategic considerations. Only incumbent firms participate in the lobbying game, as entrants are not yet active in the economy and hence do not have the resources to lobby. Nevertheless, our free-rider assumption implies that every firm that exits any given period is replaced by a new entrant with the same behaviour as the incumbent firm it replaces.

The solution concept for this game is a Truthful Nash Equilibrium (TNE), a refinement of the more traditional Subgame Perfect Nash Equilibrium (SPNE) (Bernheim and Whinston, 1986; Dixit et al., 1997) which yields a policy $\tau^*$ and a contribution schedule $C_j^*$ for each lobby. In turn, the equilibrium policy distorts the underlying regulatory framework, yielding a new equilibrium low cutoff productivity $z^*$, a new mass of incumbents $M$ , and a new steady-state distribution of firm productivities $g(z)$.

**Truthful Nash Equilibrium.** A TNE is a solution refinement needed because of the potential multiplicity of Subgame Perfect Nash Equilibria. It focuses on equilibria characterized by *truthful* contributions, where each lobby's contribution schedule is a sincere reflection of its welfare objectives. Truthful contributions are defined relative to a specific welfare level $U^{\circ}$. These contributions are structured so that, for any given policy instrument, a lobby contributes exactly as much as needed to maintain a welfare level equivalent to $U^{\circ}$. In equilibrium, both lobbies, aware of the presence of the other, strategically craft their contributions to ensure that the policymaker takes their contributions into account, without overextending in a way that would detract from their own welfare. To ensure that the policymaker does not simply ignore the lobby, the lobby must contribute in a manner that justifies its inclusion in the policymaker's consideration,by contributing exactly as much as needed so that the policymaker's welfare is at least as high as it would be if the lobby were ignored, the policymaker's best outside option. This is the lobby's main constraint. Subject to this constraint, the lobby must then contribute in a manner that maximizes its own welfare, which is a function of aggregate profits minus contributions. Taking as given the other lobby's contribution schedule, each lobby's contribution schedule is a best response to the other lobby's contribution schedule, The problem then becomes one of finding the appropriate welfare level $U^{\circ}$, as opposed to the more complicated problem of finding the best response to the other lobby's contribution schedule. This equilibrium mechanism underscores a delicate balance: each lobby must contribute in a manner that justifies its inclusion in the policymaker's consideration, without overextending in a way that would detract from its own welfare. For further details on the setup and characterization of these equilibria, see Appendix Sections 1.B.1 and 1.B.2, which elaborate on the admissible policy instruments, the definition of best responses, and the equilibrium conditions within the lobbying game.

**Political Equilibrium.** A political equilibrium is composed of a policy vector $\tau^*$, the action chosen by the policymaker in a TNE of the lobbying game, and the low cutoff productivity $z^*$ induced by such policy. The political equilibrium is a generalization of an equilibrium in the baseline economy. The trivial case where no lobby participates is equivalent to the baseline equilibrium, where the policymaker chooses $\tau = (1,1)$ and collects no contributions. Let us analyze the effect a political equilibrium has on the baseline economy. We have three possible cases: One lobby participates in the game, either the lobby for low productivity firms ($LP$) or the lobby for high productivity firms ($HP$), or both lobbies participate in the game. We analyze each case in turn, starting with both single-lobby cases.

**Single-Lobby Game**

**Single Lobby Equilibria.** Let $\Pi_j(\tau)$ be the aggregate profits of members of lobby $j \in J$ and let $\Delta W(\tau^*) = W(1,1) - W(\tau^*) \geq 0$ be the change in consumer welfare generated by implementing policy vector $\tau^*$. The following proposition characterizes the TNE of the lobbying game when only lobby $j$ participates.

**Proposition 1** *Suppose only lobby $j$ participates in the lobbying game. In a truthful nash equilibrium (TNE), the policymaker's welfare level remains unchanged and, if the policymaker is selfish enough, the lobby's equilibrium welfare level is strictly positive. The TNE is characterized by a pair $(\tau^\circ, U^\circ)$, composed of a policy vector and a welfare level, such that:*

$$\tau^\circ = \underset{\tau \in \mathcal{T}}{\arg\max}\{aW(\tau) + \Pi_j(\tau)\}$$

$$U^\circ = \Pi_j(\tau^\circ) - a\Delta W(\tau^\circ)$$

*With corresponding contribution schedule:*

$$0 \leq C^T(\tau^\circ, U^\circ) = a\Delta W(\tau^\circ) \leq \bar{C}$$

**Proof of Proposition 1.** See Appendix 1.B.2

Proposition 1 shows that the policymaker's welfare level is unaffected by the lobby's participation in the game, and that the lobby's welfare level is strictly positive if the weight $a$ assigned to consumer welfare is small enough. This result is linked to the nature of Truthful Nash Equilibria - the lobby compensates the policymaker for every unit of welfare she loses by shifting the policy instrument away from its optimal laissez-faire status, providing her with just enough political contributions so as to maintain the same ex-ante welfare level. The lobby pays the policymaker just enough to be indifferent between the laissez-faire policy and the policy that maximizes the lobby's welfare level, i.e. enough to ignore the welfare loss induced by the policy change. The lobby is effectively paying the policymaker to not have a conscience. There are two possible scenarios, as either the lobby for low productivity firms ($LP$) or the lobby for high productivity firms ($HP$) can participate. In both cases, the policymaker's objective function is the same, albeit the effect on the firm size distribution is qualitatively different in each case. We analyze each case in turn, starting with the lobby for low productivity firms ($LP$).

**Lobby for Low Productivity Firms.** The lobby for low productivity firms ($LP$) is an abstraction for an industry-wide organization that represents the interests of a large number of small establishments with similar political goals. It exchanges political contributions for an increase in the entry fee, which shifts the cutoff productivity level to the left. The resulting political equilibrium is characterized by a lower cutoff productivity level $z^*$, as well as lower consumer welfare $W^*$, a higher mass of incumbents $M^*$, and a lower steady-state dispersion of firm productivities, i.e. a less concentrated firm size distribution $g(z)$.

**Lobby for High Productivity Firms.** The lobby for high productivity firms pursues a different goal - it attempts to drive out competitors in order to increase its market share. To do so, it exchanges political contributions for an increase in the operating cost, which shifts the cutoff productivity level to the right. The resulting political equilibrium is characterized by a higher cutoff productivity level $z^*$, but with lower number of varieties $M^*$, and lower consumer welfare $W^*$, and a higher steady-state dispersion of firm productivities, i.e. a more concentrated firm size distribution $g(z)$.

**Concentration and Political Equilibrium.** Both cases have distributional consequences[11]. The lobby for low productivity firms ($LP$) benefits small, low-productivity firms, while the lobby for high productivity firms ($HP$) benefits big, high-productivity firms. In both cases, the lobby's political equilibrium is characterized by a shift in the firm size distribution, albeit in opposite directions, as well as a reduction in consumer welfare. In the case of the lobby for low productivity firms ($LP$), the political equilibrium is characterized by a lower cutoff productivity level $z^*$, as well as lower consumer welfare $W^*$ and lower average and a lower steady-state dispersion of firm productivities, i.e. a less concentrated firm size distribution $g(z)$. In the case of the lobby for high productivity firms ($HP$), the political equilibrium is characterized by a higher cutoff productivity level $z^*$, but with lower consumer welfare $W^*$, a lower mass of incumbents $M^*$, and a higher steady-state dispersion of firm productivities, i.e. a more concentrated firm size distribution $g(z)$. Our CES framework implies all firms have the same mark-up, so the analysis done here regarding the effect of the political equilibrium on *market power* is not directly applicable. Nevertheless, recent evidence suggests that the documented increase in market power is largely driven by an an increase of market share by high-productivity, high-markup firms, as opposed to an increase in markups across the board, which is consistent with our analysis (Baqaee and Farhi, 2019; De Loecker et al., 2020; Autor et al., 2020c).

**Multiple-Lobby Game**

**Multiple-Lobby Equilibria.** Let $\Pi_{LP}(\tau)$ and $\Pi_{HP}(\tau)$ be, respectively, lobby $LP$ and lobby $HP$'s aggregate profits. By definition their sum equals aggregate industry profits, $\Pi_{LP}(\tau)+\Pi_{HP}(\tau) = \Pi(\tau)$. As shown in Appendix 1.B.2, this quantity is independent of $\tau$ as long as the underlying industry equilibrium is well-defined - implying we are dealing with a zero-sum game. Each lobby tries to influence the policymaker to modify $\tau$ so as to

[11]Distributional in the sense that the effect on the firm size distribution is not uniform, not in the sense of the distribution of income.

increase the share of profits that accrue to its members. A key difference between the single-lobby and multi-lobby games is that, in the latter, the policymaker has as leverage the credible threat to ignore any one of the participating lobbies and only accept political contributions from the other. This leverage allows the policymaker to extract rents from both lobbies without having to compromise on consumer welfare. The following proposition characterizes the TNE of the lobbying game when both lobbies participate.

**Proposition 2** *Multiple lobby game TNE*

*Suppose $J = \{LP, HP\}$ is the set of lobbies participating in the lobbying game. Then*

*(i) The TNE policy vector $\tau^\circ$ will be equal to the welfare maximizing policy vector $\tau^\circ = (1,1)$.*

*(ii) The policymaker has a higher welfare level compared to the baseline case.*

**Proof of Proposition 2.** Multiple lobby game TNE

See Appendix ~ 1.B.2. ■

**Corollary 1** *Let $(\tau^\circ, \{U_j^\circ\}_{j\in J})$ be the TNE of a lobbying game with both lobbies and let $\tau''$ and $\tau'$ be such that:*

$$\tau' = \arg\max_{\tau\in\mathcal{T}} \{aW(\tau) + C_{LP}^T(\tau, U_{LP}^\circ)\}$$

$$\tau'' = \arg\max_{\tau\in\mathcal{T}} \{aW(\tau) + C_{HP}^T(\tau, U_{HP}^\circ)\}$$

*Then the contribution schedules are such that:*

$$C_{LP}^T(\tau^\circ, U_{LP}^\circ) = \Pi_{LP}(\tau^\circ) - \Pi_{LP}(\tau'') - a[W^\circ - W(\tau'')]$$

$$C_{HP}^T(\tau^\circ, U_{HP}^\circ) = \Pi_{HP}(\tau^\circ) - \Pi_{HP}(\tau') - a[W^\circ - W(\tau')]$$

**Proof of Corollary 1**. Contribution schedules under multiple lobbies

See Appendix ~ 1.B.2. ■

In a multi-lobby TNE, the policymaker's welfare level is strictly higher than in the baseline economy, which she achieves "for free", without having to compromise on consumer welfare. However, the lobbies' welfare levels are strictly lower than in the single-lobby case, as the policymaker is able to extract rents from both lobbies, without modifying the policy vector. Corollary 1 is illustrative of this interaction and serves as a building block to develop the intuition behind the results. The contribution schedule for lobby $j$ is such that each lobby pays the policymaker just enough to so that the opposite lobby does not have an incentive to pay more, which is exactly the amount of rents the opposite lobby would receive if it participated in the game by itself. Contributing less than this amount would result in the opposite lobby having an incentive to pay more, while contributing more than this amount would be inefficient since the opposite lobby would not have an incentive to pay more, as it would be more than the amount of rents it would receive in its best case scenario, namely the single-lobby game. The ex-ante revenue ratio between a firm with productivity $z_H$ and a firm with productivity $z^*$ is an endogenous variable that depends on the model's parameters, and has a direct effect on the incentive to lobby. In particular, in order for the multi-lobby game to happen, the potential gain from lobbying has to be large enough to offset the welfare loss induced by the policy change, for both lobbies. Otherwise, suppose without loss of generality that lobby's $LP$'s potential gain from lobbying is not large enough to offset the welfare loss it would induce to the policymaker. Then, the policymaker would not have a credible threat to ignore lobby $HP$'s contributions, and the game would revert to a single-lobby game. The same logic applies to lobby $HP$'s contributions.

Nevertheless, the self-similarity of the Pareto distribution hides an important asymmetry between the two lobbies. While firms in the lobby for low productivity firms ($LP$) face a credible threat of being driven out of business by a policy vector $\tau''$, and thus have to contribute accordingly, firms in the lobby for high productivity firms ($HP$) do not face such a threat of being driven out of business by the policy vector $\tau'$. The more concentrated the firm size distribution, the bigger the incentive for the lobby for high productivity firms ($HP$) to try to drive out competitors through lobbying. While not explicitly modeled in our framework, the presence of fixed costs of entry into lobbying, identified in the literature, would suggest that lobbying is more profitable for, and more likely to be observed from, the lobby for high productivity firms ($HP$) (Kerr et al., 2014).

Ride sharing mobile applications are a great real-world anecdote of a how an exogenous technological shock can affect the incentives to lobby. Lobbying against the status quo is part of Uber's business. Since the inception of Uber (the most widely used ride-hailing mobile application), the price of taxi licences, the main barrier to entry in the taxi industry, has plummeted (Martini, 2017).

Another illustrative example is the 2018 legislative episode in the U.S. Congress regarding a modification of the Dodd–Frank Wall Street Reform and Consumer Protection Act, originally enacted to protect consumers from financial institutions' irresponsible behaviour that led to the 2008 financial crisis (Miller and Ruane, 2012). During the rewriting procedures, small banks actively fought and lobbied against their big counterparts, in a similar fashion to the intra-industry political conflict of the multiple lobby game[12].

## 1.3. Concluding Remarks

Legislative outcomes are highly complex endeavors and neither the single lobby game nor its multiple lobbies counterpart necessarily map to a single or two opposing lobby(ies). In this paper, I describe a mechanism through which SIGs can capture the regulatory

[12] "Small banks trump Wall Street on Dodd-Frank rewrite", retrieved from https://www.reuters.com/article/us-usa-house-banks-lobbying/small-banks-trump-wall-street-on-dodd-frank-rewrite-idUSKCN1IN328 on 2021-25-11

environment, and analyzed the effects of such capture on the firm size distribution and on consumer welfare. Our approach exemplifies the importance of firm-level heterogeneity, as even within narrowly defined industries, SIGs can, and often do, operate with opposing policy goals in mind (Egerod and Junk, 2022). The analysis yields a sharp prediction: lobbying can have tangible effects on real economic outcomes. In two of the three cases considered, the single lobby ones, consumer welfare was unambiguous lower than in the baseline case. While that was not the case in the third case considered, the multi-lobby game, this result hinges on the self-similar property of the Pareto distribution, not on the lobbying process itself. Augmenting the model with entry costs to lobbying, as empirical evidence suggests are prevalent (Kerr et al., 2014), as well as considering endogenous markups and monopsony power in the labor market[13], would yield a more pronounced effect on the firm size distribution in favor of larger firms with higher markups, suggesting a further explanation for the rise in market concentration and average markups, as well as on the decline of the labor share of income, in the U.S. (Baqaee and Farhi, 2019; Autor et al., 2020c; Philippon, 2019).

Nevertheless, the model considered in this paper is already able to show that lobbying can have a significant impact on the firm size distribution, and therefore on the aggregate economy, without sacrificing tractability nor simplicity. It also highlights conditions under which lobbying can be welfare-enhancing, namely when it is able to counteract already entrenched rent-seeking[14]. Future research should explore the effect of lobbying on long-run outcomes such as growth, income and wealth inequality and technological or institutional development (Philippon, 2019).

[13]It is well documented that bigger, more productive firms with lower marginal costs have higher markups and pay higher wages (De Loecker et al., 2020).

[14]See, for example, the case of ride-sharing apps versus taxis in the U.S. in Tzur (2019).

# Appendix 1.A Benchmark Economy

## 1.A.1 Model Description

**Demand.** The representative agent's preferences over varieties $\omega \in \Omega$ are represented by the utility funtion

$$U = \left[ \int_{\Omega} q(\omega)^{\rho} d\omega \right]^{1/\rho} \tag{1.6}$$

Where $\sigma = \frac{1}{1-\rho} > 1$ is the elasticity of substitutions between varieties[15]. The representative agent maximizes her utility subject to her budget constraint. Let $I$ be the agent's income and define the price index $P$ in the usual way:

$$P = \left[ \int_{\Omega} p(\omega)^{1-\sigma} d\omega \right]^{1/1-\sigma} \tag{1.7}$$

Utility maximization implies the budget constraint is binding, total consumer expenditure will be her total income and hence $I = \int_{\Omega} p(\omega) q(\omega) d\omega = PQ$, where $Q = U$ is a composite good with price $P$. Solving for each variety's optimal level of consumption yields their demand curve as a function of its price, as well as the consumer's total expenditure level for each variety:

$$q(\omega) = Q \left[ \frac{p(\omega)}{P} \right]^{-\sigma} \tag{1.8}$$

$$r(\omega) = I \left[ \frac{p(\omega)}{P} \right]^{1-\sigma} \tag{1.9}$$

This ends the description of the consumer's problem. The next step is to describe the production side of the economy.

[15]Conversively, $\rho = \frac{\sigma-1}{\sigma}$

**Production.** The economy is populated by a continuum of firms indexed by $z \in [0, \bar{z}]$ with productivity $z$. Each firm produces a single variety and each variety is produced by a single firm. Firms are heterogeneous in their productivity $z$, which is reflected in their labor demand function $n(q,z) = \frac{q}{z} + \tau_o f_o$, where $\tau_o$ is a policy instrument and $f_o$ is an industry wide operating cost. Let $w$ be the wage rate. Firms face the representative agent's demand curve (equation ~ 1.8), engage in monopolistic competition, and they set prices to maximize per-period profits. The profit maximizing problem of the firm is

$$\max_p \pi(z) = pq(p) - wn(q(p))$$

Which yields the optimal pricing rule $p(z) = \frac{w}{\rho z}$, where $\rho = \frac{\sigma-1}{\sigma} < 1$ is a firm's markup over marginal cost. Let $q(z) \equiv q(p(z)), n(z) \equiv n(q(z),z), r(z) \equiv p(z)q(z)$ and $\pi(z) \equiv r(z) - wn(z)$ respectively denote output, labor demand, revenue and profits of a firm with productivity $z$. More productive firms produce more output, hire more labor, and make more profits.

**Industry Aggregates.** Define $\tilde{z}$ by

$$\tilde{z} = \left[ \int_Z z^{\sigma-1} dg(z) \right]^{1/\sigma-1} \tag{1.10}$$

As in Melitz (2003a), we use $\tilde{z}$ as the definition of average industry productivity. We also use it to express the price index and the other aggregate quantities. Recall that the price index is integrating over all available varieties. We instead integrate over the set of incumbent productivities. Since every variety is manufactured using a specific productivity, the integral is over the support of $z$ using the density $g(z)$:

$$P = \left[\int_{\Omega} p(\omega)^{1-\sigma} d\omega\right]^{1/1-\sigma} = \left[\int_{Z} p(z)^{1-\sigma} M dg\right]^{1/(1-\sigma)} = M^{\frac{1}{1-\sigma}} p(\tilde{z})$$

$$R = PQ = Mr(\tilde{z}) \qquad \Pi = M\pi(\tilde{z})$$

where $M$ denotes the total mass of incumbent firms.

**Zero Cutoff Profits.** The value of an active firm is defined as its net present value at entry:

$$v(z) = \sum_{t=0}^{\infty} (1-\delta)^t \pi(z) = \frac{\pi(z)}{\delta}$$

The lack of time discounting is for simplicity as the probability of death each period effectively discounts future profits. The cutoff productivity level $z^* = \inf\{z : v(z) > 0\}$ is the lowest level of productivity so that firm value is larger than zero. It can be used to characterize the industry's productivity distribution $g(z)$, since it is a scaled version of the exogenous productivity distribution of potential entrants $h(z)$:

$$g(z) = \begin{cases} \frac{h(z)}{1-H(z^*)} & z \geq z^* \\ 0 & z < z^* \end{cases}$$

Profits can be rearrange to $\pi(z) = r(z)/\sigma - w f_o \tau_o$, a more useful expression[16]. By definition $\pi(z^*) = 0$ and thus $r(z^*) = \sigma w f_o \tau_o$. Using, $\tilde{z}, \tilde{\pi}$ and $\tilde{r}$ can be written in terms

[16]To see this plug the definition of demand and labor demand into the definition of profits $\pi(z) = p(z)q(z) - wn(z)$, note that $\frac{1}{\sigma} = 1 - \rho$ and rearrange

of the low cutoff productivity $z^*$:

$$\tilde{z} = \left[ \frac{1}{1-H(z^*)} \int_Z z^{\sigma-1} dh \right]^{1/\sigma-1}$$
$$\tilde{r} = \left[ \frac{\tilde{z}(z^*)}{z^*} \right]^{\sigma-1} r(z^*)$$

and thus average firm profit can be expressed as a function of $z^*$:

$$\tilde{\pi} = \frac{\tilde{r}}{\sigma} - w f_o \tau_o = \left[ \frac{\tilde{z}(z^*)}{z^*} \right]^{\sigma-1} \frac{r(z^*)}{\sigma} - w f_o \tau_o = w f_o \tau_o k(z^*) \tag{1.11}$$

where $k(z^*) = \left[ \frac{\tilde{z}(z^*)}{z^*} \right]^{\sigma-1} - 1$. Equation ~ 1.11 is the famous zero cutoff profit condition (ZCP).

**Free Entry.** A futher condition is needed to pinpoint the equilibrium cutoff productivity $z^*$. Free entry implies that the expected value of creating a new firm must be equal to zero. Let $\tilde{v} = \frac{\tilde{\pi}}{\delta}$ denote the expected value of successful entry and let $p_{en}$ be the associated probability. Then:

$$p_{en} \tilde{v} = [1 - H(z^*)] \frac{\tilde{\pi}}{\delta} = w \tau_e f_e$$
$$\tilde{\pi} = \frac{\delta w \tau_e f_e}{1 - H(z^*)} \tag{1.12}$$

Equation ~ 1.12 is the free entry condition, which, independently from the zero cutoff profit condition links average firm profit and the low cutoff productivity level.

**Equilibrium.** Define $\zeta(z) \equiv k(z)[1 - H(z)]$. In equilibrium the low cutoff productivity adjusts so that both conditions hold:

$$\tilde{\pi} = wf_o\tau_o k(z^*) = \frac{w\delta f_e\tau_e}{1 - H(z^*)}$$

Which implicitely defines the equilibrium low cutoff productivity level by

$$z^* = \zeta^{-1}\left(\frac{\delta f_e\tau_e}{f_o\tau_o}\right)$$

As shown in the appendix of Melitz (2003a), $\zeta(z)$ is strictly decreasing in $\mathcal{Z}$ and thus is invertible, only leaving the issue of existence to address. While it might be the case that the point where the inverse function $\zeta^{-1}$ is being evaluated is not on its domain, this question depends on the specification of $H(z)$ and thus for the moment we assume $z^*$ exists.

**Welfare.** Each period $\delta M$ firms die, potential entrants pay the entry fee and, if their productivity is high enough, they start operations. Denote the mass of potential entrants by $M_e$. Successful entrants are those who have a higher productivity than $z^*$, that is, $[1 - H(z^*)]M_e$ firms successfully enter the market each period. Stability of the firm distribution implies that $[1 - H(z^*)]M_e = \delta M$. This flux of firms entering and exiting at the same time does not influence $g(z)$, since both groups of firms have the same productivity distribution. Let $N_e = M_e\tau_e f_e$ be aggregate entry investment paid by entrants in terms of labor. The free entry condition (equation ~ 1.12) implies that total payments to entry labor equal aggregate industry profit:

$$wN_e = wM_e\tau_e f_e = \frac{\delta M}{1 - H(z^*)}w\tau_e f_e = M\tilde{\pi} = \Pi$$

Where the last equation comes from the definition of $\tilde{\pi}$. The only resource constraint in this economy is the economy's labor force $N$, allocated between production and investment labor. Let $N_p$ denote the total amount of labor allocated towards production, such that $N = N_p + N_e$. By definition, aggregate industry profits must equal the difference between total industry revenue and total payments to labor:

$$\Pi = I - wN_p \iff I = w(N_p + N_e)$$

Hence, total worker income is equal to total industry expenditure in labor. The price index and the equilibrium mass of firms can be written in terms of the wage rate $w$, total labor supply $N$, industry's per-period fixed cost $f$ and the elasticity of substitution $\sigma$:

$$M = \frac{wN}{\sigma[\tilde{\pi} + wf_o\tau_o]}, \qquad P = \frac{wM^{1/(1-\sigma)}}{\rho\tilde{z}(z^*)} = \frac{w}{\rho z^*}\left[\frac{N}{\sigma f_o \tau_o}\right]^{1/(1-\sigma)} \tag{1.13}$$

Per-capita welfare defined as wages' purchasing power:

$$W = wP^{-1} = \left[\frac{N}{\sigma f_o \tau_o}\right]^{1/(\sigma-1)} \rho z^*$$

For the rest of the appendix we set $w = 1$.

**Equilibrium with Pareto Distributed Productivity.** We now follow the common approach of assuming a pareto distribution with parameter $\alpha > \sigma - 1$ for the pool of potential entrants (Helpman et al., 2004)[17]. The support for $z$ is then $[1, \infty)$. The parameter $\alpha$ determines how skewed to the right the distribution is. The cumulative distribution function is:

$$H(z) = \begin{cases} 1 - z^{-\alpha} & z \geq 1 \\ 0 & z < 1 \end{cases}$$

The associated density is $h(z) = \alpha z^{-(\alpha+1)}$. We can now evaluate the integral in the definition of average industry productivity in equation ~ 1.10:

[17] The requirement on $\alpha$ is in order to guarante the existence of average firm productivity $\tilde{z}$.

$$\tilde{z}(z^*) = \left[\frac{\alpha}{\alpha-\sigma+1}\right]^{1/(\sigma-1)}(z^*)$$

Implicitely, $\tilde{z}$ depends on $\tau$ through $z^*$. We use this expression to evaluate $k(z)$ and subsequently solve for $z^*(\tau)$:

$$\begin{aligned}
k(z) &= \left[\frac{\bar{z}(z)}{z}\right]^{\sigma-1} - 1 = \frac{\alpha}{\alpha+1-\sigma} - 1 = \frac{\sigma-1}{\alpha+1-\sigma} \\
\zeta(z) &= k(z)[1-H(z)] = \left(\frac{\sigma-1}{\alpha+1-\sigma}\right) z^{-\alpha} \\
\zeta(z^*) &= \left(\frac{\delta f_e \tau_e}{f_o \tau_o}\right) \implies z^*(\tau) = k_0 \left(\frac{\tau_o}{\tau_e}\right)^{1/\alpha} \qquad (1.14)
\end{aligned}$$

where $k_0 = \left[\frac{f_o(\sigma-1)}{\delta f_e(\alpha+1-\sigma)}\right]^{1/\alpha} > 0$.

We state a lemma regarding these fundamentals and the existence of an industry equilibrium under a Pareto distribution:

**Lemma 1** *Let the productivity distribution of potential entrants be a Pareto distribution with shape parameter $\alpha > \sigma - 1$. Then a sufficient condition for an industry equilibrium pair $(\tilde{\pi}, z^*)$ to exist is:*

$$\left[\frac{(\sigma-1)f_o}{(\alpha+1-\sigma)\delta f_e}\right] \geq \frac{\tau_e}{\tau_o}$$

*which is equivalent to requiring the equilibrium low cutoff productivity $z^*$ be within the support of H(z). In particular, for the equilibrium pair $(\tilde{\pi}, z^*)$ to exist when $\tau = (1,1)$ it must be that:*

$$\left[\frac{(\sigma-1)f_o}{(\alpha+1-\sigma)\delta f_e}\right] \geq 1$$

**Proof of Lemma 1**. Existence of an industry equilibrium under a Pareto distribution

The equilibrium pair is realized at the point, in $(\tilde{\pi}, z^*)$- space, where both the zero cutoff profit (equation ~ 1.12) and the free entry (equation ~ 1.11) conditions hold. The zero cutoff profit curve must be intercepted from below by the free entry condition curve, which is a strictly increasing function of $z^*$. For this to happen it must be that equation ~ 1.12 is smaller or equal than equation ~ 1.11 evaluated at the lowest $z^*$ possible, namely at the boundary of the support of $H(z)$, $[1, \infty)$:

$$\tilde{\pi}_{FE} = \tau_e f_e \delta \left(z^*\right)^\alpha \Big|_{z^*=1} = \tau_e f_e \delta \leq \frac{(\sigma-1)\tau_o f_o}{(\alpha+1-\sigma)} = \tilde{\pi}_{ZCP}$$

Rearranging is enough to prove the first claim and plugging in the welfare maximizing policy $\tau = (1, 1)$ proves the second. ■

Lemma ~ 1 helps understand the set of feasible policy instruments. The low productivity threshold determines the equilibrium distribution of productivities and thus the aggregate quantities of interest in the economy. By assuming firm productivity is Pareto-distributed we are making an implicit assumption on the support of $z$ and thus must ensure that the resulting $z^*$ is within this support.

Now, for completeness, let us substitute $z^*$ into the expressions derived for the mass of active firms $M$, the industry's profit level $\Pi$ and aggregate welfare $W$:

$$M = \frac{(\alpha+1-\sigma)N}{\alpha\sigma f_o \tau_o}, \quad \Pi = \frac{\rho N}{\alpha}, \quad W = \left[\frac{N}{\sigma f_o}\right]^{1/(\sigma-1)} \rho k_0 \left(\frac{1}{\tau_e \tau_o^{\frac{\alpha-(\sigma-1)}{\sigma-1}}}\right)^{1/\alpha} \tag{1.15}$$

Where it is clear that the welfare maximizing policy is $\tau = (1,1)$, as in Jung (2012).

### 1.A.2 Lobby Membership in the Baseline Economy

**High Productivity Lobby.** I now turn to the question on how to partition the set of firms $\mathcal{Z}$ into two groups, one for each lobby. I take a step back to consider the profit function of a firm with productivity z, $\pi(z)$. We are interested in understanding how $\pi(z)$ changes with respect to the policy instrument associated with the firm's operating cost, $\tau_f$, in order to identify the productivity level at which profits become increasing in $\tau_f$. Let $z$ and $z^*$ be, respectively, the productivity of an arbitrary incumbent firm and the low cutoff productivity, noting that by definition $z \geq z^*$. A firm with productivity level $z$ has profits[18]:

$$\pi(z) = f_o \tau_o \left[ \left( \frac{z}{z^*} \right)^{\sigma-1} - 1 \right]$$

Taking the derivative with respect to $\tau_o$ yields:

$$\begin{aligned} \frac{\partial \pi}{\partial \tau_o} &= f_o \left[ \left( \frac{z}{z^*} \right)^{\sigma-1} - 1 \right] + \tau_o f_o z^{\sigma-1} (1-\sigma)(z^*)^{-\sigma} \frac{\partial z^*}{\partial \tau_o} \\ &= f_o \left( \frac{z}{z^*} \right)^{\sigma-1} - f_o - \tau_o f_o (\sigma-1) z^{\sigma-1} (z^*)^{-\sigma} \frac{\partial z^*}{\partial \tau_o} \frac{z^*}{z^*} \\ &= f_o \left[ \left( \frac{z}{z^*} \right)^{\sigma-1} (1 - \varepsilon_{\tau_o}^{z^*} (\sigma-1)) - 1 \right] \end{aligned}$$

where

$$\varepsilon_{\tau_o}^{z^*} = \frac{\partial z^*}{\partial \tau_o} \frac{\tau_o}{z^*}$$

[18] Recall the derivation of the zero cutoff profit condition (equation ~ 1.11).

Suppose that $\varepsilon_{\tau_o}^{z^*}(\sigma-1) > 1$. Then firm profits are decreasing in $\tau_o$ at all productivity levels and thus there is no threshold productivity level at which profits become increasing in $\tau_o$. As discussed in the main text, this situation could arise in a highly competitive industry, such as one with a sufficiently high elasticity of substitution between varieties, or one with very low profit margins where a small increase in operating costs would be enough to cause a considerable number of firms to exit the market.

Alternatively, suppose that $\varepsilon_{\tau_o}^{z^*}(\sigma-1) < 1$, as is the case under the assumption of Pareto-distributed productivity. We are interested in locating the productivity level at which profits become increasing in $\tau_o$. Let that productivity level be $z_H$ and set $\frac{\partial \pi}{\partial \tau_o}(z_H) = 0$:

$$\left(\frac{z_H}{z^*}\right)^{\sigma-1}(1-\varepsilon_{\tau_o}^{z^*}(\sigma-1)) - 1 = 0$$

$$\left(\frac{z_H}{z^*}\right)^{\sigma-1} = \frac{1}{1-\varepsilon_{\tau_o}^{z^*}(\sigma-1)}$$

We know that $z_H \geq z^*$ and by assumption $\varepsilon_{\tau_o}^{z^*}(\sigma-1) < 1$, implying that for all $z > z_H$ ($z^* \leq z < z_H$), profits are increasing (decreasing) in $\tau_o$. Under the Pareto assumption used in our paper we can show that the inequality $\varepsilon_{\tau_o}^{z^*}(\sigma-1) < 1$ does hold:

$$0 < \varepsilon_{\tau_o}^{z^*}(\sigma-1) = \frac{\sigma-1}{\alpha} < 1$$

The middle step follows from the definition of $\varepsilon_{\tau_o}^{z^*}$ and the equilibrium expression for $z^*$ (equation 1.14). Noting that $\left(\frac{z}{z^*}\right)^{\sigma-1}$ is equal to the revenue ration between a firm with productivity $z$ and a firm with productivity $z^*$, we have that, in the baseline economy with a Pareto productivity distribution, the following relationship between the marginal incumbent (low productivity) firm, and the marginal high productivity firm is equal to the ratio of their revenues:

$$\left(\frac{z_H}{z^*}\right)^{\sigma-1} = \frac{r(z_H)}{r(z^*)} = \frac{\alpha}{\alpha+1-\sigma} = \frac{1}{1-\frac{\sigma-1}{\alpha}} \tag{1.16}$$

**Low Productivity Lobby.** The same logic cannot be applied to the low productivity lobby, as the profit function of a firm with productivity $z$ is increasing in $\tau_e$ at all productivity levels. One would then be tempted to conclude that all firms would lobby for a higher $\tau_e$. However, while it is true that the profit function is increasing in $\tau_e$ at all productivity levels, the effect of a higher $\tau_e$ on *aggregate* profits of firms with productivity $z > z_H$ is in fact negative. To see this, we can integrate the profit function from $z^*$ to $z_H$, and from $z_H$ to $\infty$, and compare the two expressions.

$$\Pi_{LP}(\tau) = \frac{(\alpha+1-\sigma)N}{\sigma}\left[\frac{\sigma-1}{\alpha(\alpha+1-\sigma)} + \frac{1}{\alpha}\left(\frac{z^*}{z_H}\right)^{\alpha} - \frac{1}{\alpha-(\sigma-1)}\left(\frac{z^*}{z_H}\right)^{\alpha-(\sigma-1)}\right]$$

$$\Pi_{HP}(\tau) = \frac{(\alpha+1-\sigma)N}{\sigma}\left[\frac{1}{\alpha-(\sigma-1)}\left(\frac{z^*}{z_H}\right)^{\alpha-(\sigma-1)} - \frac{1}{\alpha}\left(\frac{z^*}{z_H}\right)^{\alpha}\right]$$

Where we see that in fact the lobbying game is a zero-sum game, as the gains of the high productivity lobby are exactly equal to the losses of the low productivity lobby, and vice versa. While firm-level profits are increasing in $\tau_e$ at all productivity levels, the effect of a higher $\tau_e$ on aggregate profits is negative for firms with productivity $z > z_H$ because more firms enter the market and compete for the same pool of consumers, so that, on aggregate, the density shifts to the left, in effect reducing aggregate profits for firms with productivity $z > z_H$.

# Appendix 1.B The Lobbying Game

## 1.B.1 Game Setup

**Admissible Policy Instruments.** The set of admisible policy instruments is denoted by $\boldsymbol{\mathcal{T}}$. Any $\tau \in \boldsymbol{\mathcal{T}}$ must obey the following constraints:

i. We do not allow for subsidies and hence limit our policy instruments to be bounded below by one.

ii. Total labor supply is constant and thus total labor demand cannot exceed it.

iii. The policy instrument must be such that an industry equilibrium as defined in the previous section is achieved.

The first constraint is for simplicity's sake, as it avoids redistribution and the required modifications to the agent's budget constraint, so that we can focus on loss of welfare and changes in the firm distribution. The second constraint is just formally stating the economy's labor constraint. Since the supply of labor is fixed, any policy change must shift labor between production and investment without increasing the total amount of labor demanded. The third constraint is related to the choice of a Pareto distribution and follows from Lemma 1, stating that the set of feasible policy instruments must respect it.

**Best Response.** A feasible contribution schedule $C_j^\circ(\tau)$ and admissible policy vector $\tau^\circ$ are said to be a best response to $C_{-j}^\circ(\tau)$ if

(i) $\tau^\circ \in \arg\max_{\tau \in \boldsymbol{\mathcal{T}}} \{G[\tau, \boldsymbol{C}^\circ(\tau)]\}$ , where $\boldsymbol{C}^\circ = (C_j^\circ(\tau), C_{-j}^\circ(\tau))$

(ii) There is no other feasible contribution schedule $C_j(\tau)$ and admissible policy vector $\tau$ such that:

1) $U_j[\tau, C_j(\tau)] > U_j[\tau^\circ, C_j^\circ(\tau^\circ)]$

2) $\tau \in \underset{\tau \in \boldsymbol{\mathcal{T}}}{\arg\max}\{G[\tau, (C_{-j}^\circ(\tau), C_j(\tau))]\}$

In the definition of a best response it is made explicit that although the contribution schedule presented by lobby $j$ holds fixed the other lobby's contribution schedule, in a second stage the policymaker will optimize with respect to both of these and choose the policy instrument that maximizes his own objective function.

### 1.B.2 Equilibria

**Subgame Perfect Nash Equilibrium.** An equilibrium of the lobbying game consists of a vector of feasible contribution schedules $\boldsymbol{C}^\circ(\tau)$ and a policy vector $\tau^\circ \in \boldsymbol{\mathcal{T}}$ such that, for every lobby $j$, $C_j^\circ(\tau)$ and $\tau^\circ$ are a best response to $C_{-j}^\circ(\tau)$. Common agency problems can have a multiplicity of subgame perfect equilibria. This is the motivation behind the notion of Truthful Nash Equilibrium, which is the equilibrium concept we use in this paper and we now define.

**Truthful Contribution Schedules.** A contribution schedule $C_j^T(\tau, U^\circ)$ from lobby $j$ is said to be *truthful* relative to welfare level $U^\circ$ if:

$$C_j^T(\tau, U^\circ) = \min\left\{\bar{C}, \max\{0, \theta(\tau, U^\circ)\}\right\}$$

with $\theta$ such that:

$$U_j[\tau, \theta(\tau, U^\circ)] = U^\circ$$

A truthful contribution schedule relative to a welfare level $U^\circ$ embodies the idea that, whatever policy instrument is chosen, the lobby will contribute the amount necessary to achieve precisely this welfare level so long as the contribution required to achieve it is feasible.

**Truthful Nash Equilibrium.** A Truthful Nash Equilibrium (TNE) of the lobbying game is a policy vector $\tau^\circ$ and a collection of contribution schedules $\{C_j^T(\tau^\circ, U_j^\circ)\}_{j\in J}$ from each lobby that are truthful relative to the lobbies' equilibrium welfare levels. We use **Proposition 3** of Dixit et al. (1997), adapted to our notation, to characterize such an equilibrium:

**Proposition 3** *Let* $(\tau^\circ, \{C_j^T(\tau^\circ, U_j^\circ)\}_{j\in J})$ *be a truthful tash equilibrium of the lobbying game with equilibrium lobby welfare levels* $\{U_j^\circ\}_{j\in J}$*. Then* $\tau^\circ, \{U_j^\circ\}_{j\in J}$ *are such that:*

*(i)* $\tau^\circ = \underset{\tau\in\mathcal{T}}{\arg\max}\left\{G\left[\tau, \{C_j^T(\tau, U_j^\circ)\}_{j\in J}\right]\right\}$

*(ii) For each* $j \in J$

$$\max_{\tau\in\mathcal{T}} G\left[\tau, \{C_{-j}^T(\tau, U_{-j}^\circ), 0\}\right] = G\left[\tau^\circ, (C_j^T(\tau^\circ, U_j^\circ))_{j\in J}\right]$$

**Proof of Proposition 3.** See Dixit et al. (1997), Proposition 3. ■

Condition (i) implies policymaker takes the (truthful) contribution schedules as given and optimally chooses the equilibrium policy vector $\tau^\circ$ that maximizes his own objective function. Condition (ii) is more subtle. Let us take a single lobby's point of view. It proposes a contribution schedule, aware that there is another lobby participating in the game and that, once both lobbies have presented their contribution schedules, it is the policymaker who chooses the policy instrument by maximizing his own objective function. Thus, whatever contribution schedule the lobby proposes to the policymaker, it must ensure it is big enough to guarantee the policymaker will achieve at least the same level of welfare it achieves in his outside option of ignoring him (or equivalently the case where the lobby proposes a zero contribution schedule).

It is in the lobby's interest to contribute just enough to guarantee this level of welfare for the policymaker, and nothing more. To see this, consider the case where lobby $-j$ proposes a truthful contribution at the equilibrium welfare level $U_{-j}^\circ$ but lobby $j$ proposes an excessively generous contribution schedule $C_j(\tau)$, making the policymaker choose $\tau = \tau^*$. By assumption, the welfare level that the policymaker achieves under $(\tau^*, \{C^T_{-j}(\tau^*, W^\circ_{-j}), C_j(\tau^*)\})$ is higher than what he would achieve if lobby $j$ did not participate:

$$G[\tau^*, (C^T_{-j}(\tau^*, W^\circ_{-j}), C_j(\tau^*))] > \max_{\tau\in\mathcal{T}} G[\tau, (C_{-j}(\tau), 0)]$$

From the point of view of lobby $j$ this is not the best response, as the lobby could switch to a lower (in a pointwise sense) contribution schedule without fear of retaliation, a net improvement. If, on the contrary, lobby $j$ decides to lowball the policymaker, it is in the best interest of the policymaker to simply ignore this contribution schedule[19]. Lobby $j$ can go as low as lobby $-j$ allows him to, and should not go any higher.

**Single Lobby TNE**

Let $\Pi_j(\tau)$ be the aggregate profits of members of lobby $j$ and let $\Delta W(\tau^\circ) = W(1,1) - W(\tau^\circ) \geq 0$ be the change in consumer welfare generated induced by implementing policy vector $\tau^\circ$. We restate Proposition 1 from the main text:

**Proposition 1.** Suppose only lobby $j$ participates in the lobbying game. In a truthful nash equilibrium (TNE), the policymaker's welfare level remains unchanged and, if the policymaker is selfish enough, the lobby's equilibrium welfare level is strictly positive. The TNE is characterized by a pair $(\tau^\circ, U^\circ)$, composed of a policy vector and a welfare level, such that:

$$\tau^\circ = \arg\max_{\tau\in\mathcal{T}} \{aW(\tau) + \Pi_j(\tau)\}$$

$$U^\circ = \Pi_j(\tau^\circ) - a\Delta W(\tau^\circ)$$

[19] Dixit et al. (1997) features a more in- depth discussion of the arguments behind this claim.

**Proof of Proposition 1.** Single Lobby TNE

Let us first define lobby j's welfare function. We consider the case where the lobby maximizes the aggregate profits of its members net of contributions. Let $\Pi_j$ denote aggregate profits of members of lobby j. Then the lobby's welfare function is given by:

$$U_j[\tau, C_j] = \Pi_j - C_j$$

A first step in proving Proposition 1 is solving the lobbying game for the equilibrium policy vector and contribution level. Let us first focus on the policy vector. We can exploit the lobby welfare function's linearity in the contributions to use **Corollary 1** to **Proposition 4** of Dixit et al. (1997), which provides a close form expression for the agent's equilibrium action in a TNE:

$$\tau^\circ = \arg\max_{\tau \in \mathcal{T}} \{aW(\tau) + \Pi_j(\tau)\} \tag{1.17}$$

Directly as claimed in the proposition. The policy vector maximizes the joint welfare of the lobby and the consumer, with $a$ representing the weight placed on consumer welfare by the policymaker. For the moment, suppose that an interior solution to the previous program exists. Now let us denote the equilibrium welfare of the participating lobby by:

$$U^\circ \equiv U_j[\tau^\circ, C_j^T(\tau^\circ, U^\circ)]$$

Evaluating the truthful contribution schedule at the equilibrium pair $(\tau^\circ, U^\circ)$ and rearranging yields[20]

$$0 \leq C_j^T(\tau^\circ, U^\circ) = \Pi_j(\tau^\circ) - U^\circ \leq \bar{C}$$

[20]We are taking care of not violating the feasibility constraints the contribution schedule is subject to.

Define $\Delta W(\tau^\circ) \equiv [W(1,1) - W(\tau^\circ)]$, the loss of consumer welfare brought about by implementing $\tau^\circ$, and note that $\Delta W(\tau^\circ) \geq 0$. Using the optimality of the laissez-faire policy vector in the absence of lobbying and the characterization of a TNE presented in definition ~ 3, we know that

$$\max_{\tau \in \mathcal{T}} \{G(\tau, C_j)\}\Big|_{C_j=0} = \max_{\tau \in \mathcal{T}} \{aW(\tau)\} = aW(1,1) = G[\tau^\circ, C_j^T(\tau^\circ, U^\circ)]$$

Plugging in the expression for $C_j^T(\tau^\circ, U^\circ)$ into the policymaker's objective function in the rightmost expression from the previous equation and rearranging we have

$$aW(\tau^\circ) + \Pi_j(\tau^\circ) - U^\circ = aW(1,1)$$
$$U^\circ = \Pi_j(\tau^\circ) - a\Delta W(\tau^\circ)$$

The equilibrium contribution level is:

$$0 \leq C_j^T(\tau^\circ, U^\circ) = a\Delta W(\tau^\circ) \leq \bar{C}$$

We still have to show that $\tau^\circ$ is an interior solution to the policymaker's program and that there is an upper bound on the level of selfishness $\bar{a}$ such that it is not profitable to engage in lobbying. We focus on $\tau^\circ$ first. Recall that $M$ is the equilibrium mass of firms. By definition:

$$\Pi_j(\tau) = \int_j \pi(z) M \frac{dh(z)}{1 - H(z^*)}$$

We have suppressed the dependance of $z^*$ and $\pi(z)$ on $\tau$ for notational simplicity. We can show that under the Pareto distribution, total industry profit $\Pi$ is constant and independent of $\tau$, as long as an industry equilibrium is achieved[21]. Thus any change in aggregate profit that lobby $j$ experiences must come form lobby $-j$. Evaluating the previous integral for each lobby yields:

$$\Pi_{LP}(\tau) = \frac{(\alpha+1-\sigma)N}{\sigma}\left[\frac{\sigma-1}{\alpha(\alpha+1-\sigma)} + \frac{1}{\alpha}\left(\frac{z^*}{z_H}\right)^{\alpha} - \frac{1}{\alpha-(\sigma-1)}\left(\frac{z^*}{z_H}\right)^{\alpha-(\sigma-1)}\right]$$
$$\Pi_{HP}(\tau) = \frac{(\alpha+1-\sigma)N}{\sigma}\left[\frac{1}{\alpha-(\sigma-1)}\left(\frac{z^*}{z_H}\right)^{\alpha-(\sigma-1)} - \frac{1}{\alpha}\left(\frac{z^*}{z_H}\right)^{\alpha}\right]$$

We see that $\Pi_{LP}$ is strictly decreasing in $z^*$, while the opposite holds true for $\Pi_{HP}$. Note that $\tau^\circ$ must be feasible: it must respect the resource constraint on labor, it must imply the resulting $z^*$ is within the support of $z$ and each policy instrument cannot be lower than one. Recall from Appendix ~ 1.A.1 that $z^*$ is decreasing in $\tau_e$ and increasing in $\tau_f$, implying that each lobby will focus on lobbying for a change to a single policy instrument.

Let us analyze each lobby separately, starting with low productivity lobby $LP$., The lobby will try to push $\tau_e$ as high as possible. Assuming the resource constraint is non-binding, first order conditions imply that either

$$\frac{\partial \Pi_{LP}}{\partial \tau_e} = -a\frac{\partial W}{\partial \tau_e}$$

Or

$$\tau_e^\circ = \bar{\tau}_e$$

Where the top bound $\bar{\tau}_e \equiv (\sigma-1)f_o/(alpha+1-\sigma)\delta f_e$ ensures that the resulting $z^*$ is within the support of $z$ and thus an industry equilibrium can be achieved. By construc-

[21] Lemma ~ 1 in Appendix 1.A.1.

tion, the resulting equilibrium policy instrument $\tau^\circ = (\tau_e^\circ, 1)$ is feasible: the resource constraint is already present in $W(\tau)$[22], the industry equilibrium can be achieved since the resulting policy respects the bounds set by the support of $z$ by construction and of course subsidies are being avoided.

Now let us focus on the high productivity lobby $HP$. The lobby's interest lies in making $\tau_o$ as high as necessary to push (potential) members of lobby $LP$ completely out of the market, which it perfectly achieves if $z^*(\tau^\circ) = z_H$. Hence, $\tau_o^\circ$ is such that either:

$$\frac{\partial \Pi_{HP}}{\partial \tau_o} = -a\frac{\partial W}{\partial \tau_o}$$

Or

$$z^*(\tau^\circ) = z_H$$

The derivative of $\Pi_{HP}$ with respect to $z^*$ disappears at $z^* = z_H$, so unless the policymaker is perfectly selfish, it is the first condition that holds. Note that by construction the policy vector chosen is feasible: the resource constraint has been substituted into $W(\tau)$ from the start, $z^*(\tau^\circ)$ is within the support of $z$ and of course no subsidies are being given.

Now we show that lobbying is only profitable if the policymaker is selfish enough. Let $\Delta\Pi_j(\tau^\circ) \equiv \Pi_j(\tau^\circ) - \Pi_j(1,1)$ denote the change in aggregate profits experienced by members of lobby $j$. In the single lobby game, a perfectly selfish policymaker will try to maximize this quantity by adjusting $\tau$, while a benevolent policymaker will not care about it and set $\tau = (1,1)$. Change in lobby welfare is given by

$$\Delta U_j(\tau^\circ) \equiv \Delta\Pi_j(\tau^\circ) - a\Delta W(\tau^\circ) \tag{1.18}$$

[22]Indeed, the expression derived for $M$ comes from the resource constraint. The price index $P$ and $W$ follow.

The first element of the last equation's right hand side is increasing in $\tau_e$ for $j = LP$ (increasing in $\tau_o$ for $j = HP$), while $W(\tau)$ is decreasing in both arguments. Fix $\tau^\circ \neq (1,1)$ such that $\tau^\circ$ is feasible, and without loss of generality suppose that $\Delta\Pi_j(\tau^\circ) > 0$. Then $\Delta U_j(\tau)\big|_{\tau=\tau^\circ} = \Delta U_j(a)$ is a continuous function of $a$ with the followingcharacteristics:

$$\lim_{a\to\infty} \Delta U_j(a) = -\infty$$
$$\lim_{a\to 0} = \Delta\Pi_j(\tau^\circ)$$

By the Intermediate Value Theorem there is an $\bar{a}$ such that $\Delta U_j(\bar{a}) = 0$.

To conclude the proof, recall that the level of contributions is capped at $\bar{C}$. Now fix an arbitrary $a > 0$. As long as $a$ is low enough, the cap on contributions is not violated, $\tau^\circ$, the solution to the program in equation ~ 1.17 is achieved and $\Delta U_j > 0$. ■

**Multiple Lobby TNE**

We restate Proposition 2 from section 1.2.3 of the main text:

**Proposition 2** Suppose $J = \{LP, HP\}$ is the set of lobbies participating in the lobbying game. Then

(i) The TNE policy vector $\tau^\circ$ will be equal to the welfare maximizing policy vector $\tau^\circ = (1,1)$.

(ii) The policymaker has a higher welfare level compared to the baseline case.

**Proof of 2** Multiple lobby game TNE First let us show that the TNE policy vector in this case coincides with the welfare maximizing $(1,1)$. Recall that the objective function of lobby $j$ is given by $U_j[\tau, C_j] = \Pi_j(\tau) - C_j$. Once again we exploit linearity in the contributions to use Corollary 1 to Proposition 4 of Dixit et al. (1997):

$$\begin{aligned}\tau^{\circ} &= \arg\max_{\tau\in\mathcal{T}} \{aW(\tau) + \Pi_{LP}(\tau) + \Pi_{HP}(\tau)\} \\ &= \arg\max_{\tau\in\mathcal{T}} \{aW(\tau) + \Pi\}\end{aligned}$$

As shown in Appendix ~ 1.A.1, aggregate industry profits are constant, as long as an industry equilibrium is attained. It follows that the previous program yields the same maximizing argument as $W(\tau)$. Before showing that the policymaker's welfare is higher in the Multiple Lobby Game, let us first prove the stated corollary about lobby contributions. Condition (ii) of the TNE characterization, presented in definition ~ 3, states that each lobby non-cooperatively chooses its own ex-post welfare level $U_j^{\circ}$ such that the policymaker achieves the same welfare level whether the other lobby contributes or not:

- Lobby LP chooses $U_{LP}^{\circ}$ such that $\max_{\tau}\{aW(\tau)+C_{LP}^{T}(\tau, U_{LP}^{\circ})\} = G^{\circ}[\tau^{\circ}, \{C_j^T(\tau^{\circ}, U_j^{\circ})\}_{j\in J}]$
- Lobby HP chooses $U_{HP}^{\circ}$ such that $\max_{\tau}\{aW(\tau)+C_{HP}^{T}(\tau, U_H^{\circ}P)\} = G^{\circ}[\tau^{\circ}, \{C_j^T(\tau^{\circ}, U_j^{\circ})\}_{j\in J}]$

Let $\tau', \tau''$ be, respectively, the maximizing argument in the first and in the second case above. Expanding each equation on both sides and rearranging yields the lobbies' ex-post welfare levels:

$$\begin{aligned}U_{LP}^{\circ} &= a[W^{\circ} - W(\tau'')] + \Pi_{LP}(\tau'') \\ U_{HP}^{\circ} &= a[W^{\circ} - W(\tau'] + \Pi_{HP}(\tau')\end{aligned}$$

Plugging the previous expressions into the definition of the TNE contributions we see that

$$
\begin{aligned}
\bar{C} \geq C^T_{LP}(\tau^\circ, U^\circ_{LP}) &= \Pi_{LP}(\tau^\circ) - U^\circ_{LP} \\
&= \Pi_{LP}(\tau^\circ) - \Pi_{LP}(\tau'') - a[W^\circ - W(\tau'')] \geq 0 \\
\bar{C} \geq C^T_{HP}(\tau^\circ, U^\circ_{HP}) &= \Pi_{HP}(\tau^\circ) - U^\circ_{HP} \geq 0 \\
&= \Pi_{HP}(\tau^\circ) - \Pi_{HP}(\tau') - a[W^\circ - W(\tau')] \geq 0
\end{aligned}
$$

As stated in **Corollary** 1. We now have to show that the policymaker's welfare is higher in this TNE. To see that, let us expand $G^\circ$ with the expressions for equilibrium contributions we just derived:

$$
G^\circ[\tau^\circ, \{C^T_j(\tau^\circ, U^\circ_j)\}_{j\in J}] = aW(1,1) + \Pi - (U^\circ_{LP} + U^\circ_{HP}) \geq aW(1,1)
$$

With a strict inequality whenever contributions are positive, namely whenever the policymaker is not completely benevolent. ■

# Chapter 2

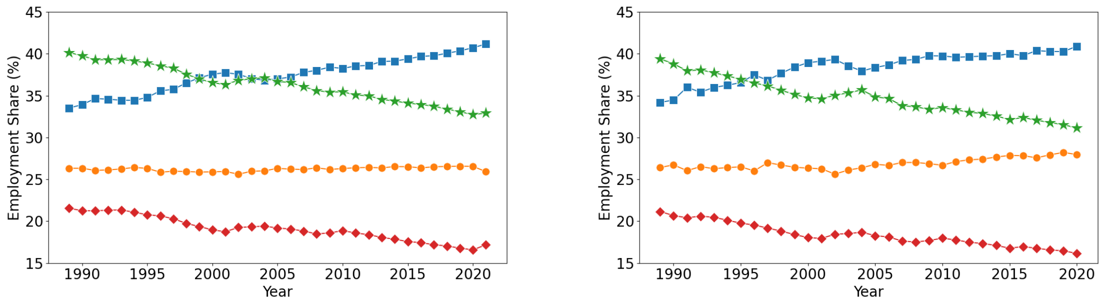
# Do Political Contributions affect Market Concentration? Evidence from the United States

## 2.1. Introduction

Industrial concentration in the United States has risen substantially over the past decades. This has given rise to an ample literature that attempts to explain the underlying causes of this trend and its implications for the macroeconomy (Syverson, 2019; Gutierrez et al., 2021; Autor et al., 2020c)[1]. Various explanations have been put forward to explain the observed trends, including the rise of superstar firms, changing demographics, and rent-seeking behavior (Loecker and Eeckhout, 2018; Covarrubias et al., 2020; Autor et al., 2020c; H. Hopenhayn et al., 2022). Figure 2.1 graphically shows this concentration increase using data from the US Census Bureau's Business Dynamics Statistics (BDS). The figures indicate that the employment share of firms with more than 2500 employees

[1]This literature is sometimes refered to as the "Macroeconomic Market Power" literature

has been increasing over time, while the employment share of firms with less than 100 employees has been decreasing, suggesting a reallocation of economic activity towards larger firms.




**(a)** Aggregate Data

**(b)** Industry Average Data

**Figure 2.1** – Evolution of average employment shares for four firm size categories. Panel (a) is constructed using all employees within each firm size category, while Panel (b) uses the unweighted average across all 3-digit NAICS industries. Each plot corresponds to a size category: firms with more than 2500 employees (squares), firms with 100-2500 employees (balls), firms with less than 100 employees (stars), and firms with less than 20 employees (diamonds).

In parallel, the rapid rise of political contributions and lobbying activity in the United States has captured the attention of researchers and the general public alike The interaction between polititians private interest groups has spawned a vast literature that attempts to disentangle the mechanisms through which this influence operates, overcome the methodological challenges to identifying its effects, and uncover the consequences for economic outcomes (Bombardini and Trebbi, 2020). On the legislative side, the rapid growth of soft money donations to political parties in the 90s led to the passage of the Bipartisan Campaign Reform Act of 2002 (BCRA), a bipartisan bill aimed at regulating the flow of money into politics, most notably by banning soft money donations to political campaigns (Malbin, 2006; Holman and Claybrook, 2004). Eight years later, in 2010, the Supreme Court's decision in the landmark case Citizens United v. FEC, partially repealed the BCRA, allowing corporations and unions to spend unlimited amounts of money on political campaigns. Given how contentious the issue of political contributions has become, it is unsurprising that the literature has struggled to reach a consensus on whether lobbying and political contributions have any significant impact on economic outcomes, with some researchers questioning the rent-seeking hypothesis in the first place and proposing instead a consumption or participation motive for political contributions (Ansolabehere et al., 2003; Ansolabehere et al., 2004).

This paper lies at the intersection of these two strands of literature. I investigate the relationship between political contributions and industry concentration in the United States during the past 3 decades. Motivated by the question of whether rent-seeking behavior can account for some of the observed rise in concentration, I explore the hypothesis that political contributions are a channel used by Special Interest Groups (SIGs) to lobby politicians and advance their own private interests, influence the regulatory environment in which they operate, and erect barriers to entry in their respective industries[2]. Have political contributions contributed to the rise in concentration in the US economy, and, if so, how? Was the BCRA effective in curbing the influence of political contributions on economic outcomes, and did the Supreme Court's decision in Citizens United v. FEC undo the progress made by the BCRA? I build upon Covarrubias et al. (2020) and Melitz (2003a) to develop a model that allows us to study how barriers to entry, namely entry and fixed costs in an industry, interact with other economic fundamentals to shape the distribution of firms' sizes and hence the level of concentration in an industry. The model provides a framework that allows us to understand how political contributions can influence this distribution, impact the regulatory landscape, and vary across industries.

A key insight from the model lies in distinguishing between industries where concentration results from innovation and those where it arises due to other factors. This

[2]For a specific example of how market regulation and barriers to entry can affect industry outcomes, the reader can take a look at the case of Oxyconting documented in Alpert et al. (2021), which documents how state-level regulation hindered the adoption of the pain-killer in some states and allowed its proliferation in others.

distinction forms a pivotal source of evidence in the ongoing debate between "Good Concentration" and "Bad Concentration" (the latter rooted in rent-seeking behavior and barriers to entry).

I then proceed to empirically estimate a series of regression models using a panel dataset encompassing 3-digit NAICS industries in the United States over the period 1990-2018, which corresponds to 15 political election cycles. The findings reveil several noteworthy patterns. I observe that political contributions are associated with a reallocation of employment towards the upper end of the firm size distribution. While there is a faint indication of this effect in the 1990s, it becomes markedly more pronounced during the early 2010s.

Following the insights from the theoretical framework, I delve deeper into this relationship by categorizing industries based on the correlation between their productivity and the measure of concentration used, the employment share at the top of the firm size distribution. Consistent with a rent-seeking hypothesis, I discover that the influence of political contributions on the firm-size distribution significantly differs between industries where TFP is not positively correlated with concentration and those where such a correlation exists. Precisely in those industries where concentration is not driven by productivity, I observe that contributions are associated with a reallocation of employment towards larger firms, at the expense of small and medium-sized enterprises. This effect is particularly pronounced in the 2010s, which is consistent with the hypothesis that the regulatory environment has become more favorable to large firms during the previous decades. Importantly, these results remain robust across various industry selection criteria.

To augment the analysis, I explore the impact of import competition on the manufacturing sector and its contribution behavior. I use import penetration from China as an exogenous increase in competition within specific industries. While the link between import competition and the elasticity of substitution precludes us from employing it as a direct instrument for political contributions, I use this source of variation to examine industry responses to heightened competition. Interestingly, I find that, in the manufacturing sector, political contributions are associated with a reallocation of employment primarily towards medium-sized firms, mostly but not exclusively at the expense of small ones. Remarkably, this effect diminishes in industries where TFP is positively correlated with the employment share at the top of the firm size distribution, once again pointing to a rent-seeking motive in these industries.

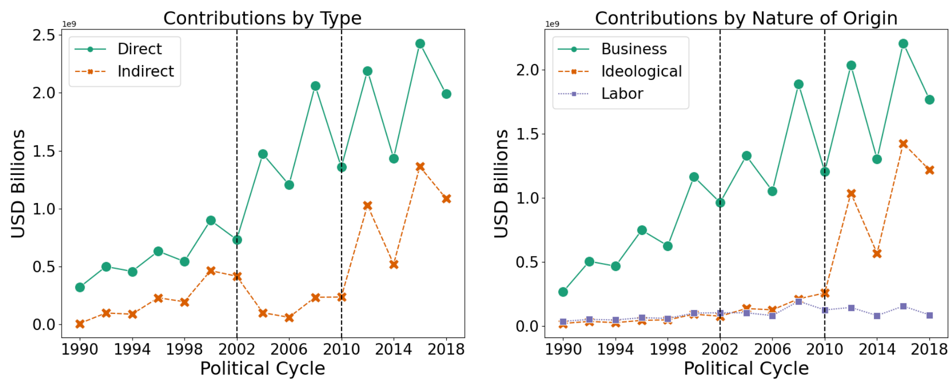



**Figure 2.2** – Political Contributions from 1990 to 2018. The left panel shows contributions disaggregated by general "type" of origin, either "direct" or "indirect". The right panel shows contributions disaggregated by "nature of origin", namely the motive behind the contribution. The three main motives are: "Business", "Labor", and "Ideological".

Finally, I exploit the remarkable surge in *ideologically* motivated political contributions in the early 2000s to construct an instrument for political contributions. Figure 2.2 shows the evolution of political contributions by type of contributor (ideological, business related, and labor related) over the period 1990-2018. The identification strategy relies on two assumptions. First, regarding the interaction between *ideological* vs *business* related groups, I assume that the entrance into the political arena of a new group of contributors with a specific ideological agenda is exogenous to the economic fundamentals of the industries in which they operate, and that it forces incumbent political contributors to adjust their contributions accordingly. Second, I assume that an industry's exposure to this exogenous shock is exogenous to its contributions. I leverage geographical variation along two dimensions to construct the instrument: the state of origin of ideological contributions, and the state-level employment share of each industry. The resulting instrument is thus a "shift-share" instrument: the *share* corresponds to each industry's share of employment located in a particular *state*, which we regard as exogenous to the industry's level of concentration, and the *shift* corresponds to the share of each states' contributions to *nation-wide* ideological contributions. The fact that, in this application, the shares are taken over *states* for each industry, as opposed to the traditional shift-share instrument, where the shares are taken over *industries* for each geographical unit, follows from the nature of the data: observations are at the industry level, not at the state level, and hence the resulting instrument leverages the variation in the state-level employment shares of each industry to compute each industry's exposure to state-level shocks to ideological contributions. The results from the two-stage least squares (2SLS) regressions are consistent with the previous findings, and provide further evidence of a rent-seeking force at play that at least partially explains the observed rise in concentration in the US economy.

The rest of the paper is organized as follows. The remainder of this introduction provides a brief overview of the literature on the rise of market power in the US economy, as well as the literature on the political economy of lobbying. Section 2.2 presents the theoretical framework, Section 2.3 describes the data used in the empirical analysis, and Section 2.4 presents the empirical results.

**Related Literature.** Ansolabehere et al. (2003) challenge the rent-seeking hypothesis by proposing an alternative explanation for campaign contributions, suggesting that contributing is a form of consumption or participation, rather than rent-seeking. In a following study, Ansolabehere et al. (2004) examines the impact of the Bipartisan Campaign Reform Act (BCRA) on corporations' soft money donations, revealing, perhaps surprisingly, little effect of soft money on economic outcomes and questioning the premise of the BCRA and societal interest in regulating political contributions at all.

In an early study linking firm heterogeneity and lobbying, Bombardini (2008) offers a micro-founded model explaining why larger firms are more likely to lobby and contribute more to political campaigns, shedding light on the variation of protection levels across sectors.

In a related study, Bombardini and Trebbi (2012) provide insights into political organization in US industries that lobby the federal government regarding trade policy. Contrary to prevailing views, they find that more competitive and less concentrated sectors are more likely to lobby together as a trade association, whereas firms in more concentrated sectors are more likely to lobby individually.

More recently, Bombardini and Trebbi (2020) present a survey of the lobbying literature in Political Economy, emphasizing the benefits of studying lobbying, as it can perpetuate economic differences, amplify inefficiencies in public policy, and facilitate rent-seeking behavior. Recent empirical approaches have made progress by considering both policy supply and demand to study firms' political behavior. However, the authors note that the welfare effects of lobbying and corporate advocacy are still not fully understood.

The idea that firms can use political contributions to influence the regulatory environment in which they operate is not unprecedented. The literature on the political economy of lobbying has long been concerned with the influence of special interests on the political process and on policy outcomes. Grossman and Helpman (1994) studies how firms and special interest groups can shape trade policy through lobbying and campaign contributions.

The choice of barriers to entry as the main mechanism through which political contributions can influence economic outcomes is motivated by the literature on the rise of market power in the US economy. In Gutiérrez et al. (2019), the authors present a comprehensive analysis of the factors contributing to the rise in industrial concentration and declining entry in the US economy, uncovering the impact of entry cost shocks on market competition. Their findings highlight the significant role of policy and regulatory environment in shaping entry cost shocks, which, in turn, have led to a decline in competition and depressed consumption, demonstrating the macroeconomic implications of rising concentration and providing direct evidence of the role of policy in shaping market power dynamics. In a related study, Gutierrez and Philippon (2022) develop a political economy model that allows them to analyze the role of institutions in market competitiveness in Europe, emphasizing the role of independent institutions and their effects on lobbying behavior.

A recent contribution by Akcigit et al. (2023) furthers our understanding of the dynamics at play. They investigate the impact of political connections on firm dynamics and innovation, shedding light on the interconnected factors that shape economic outcomes, using a firm dynamics model where firms can invest in innovation and political connections to enhance their productivity. They test their model's predictions using Italian firm-level data. Similar to us, they find that political connections relate to a higher rate of survival, as well as growth in employment and revenue, but not in productivity. In a similar study, Akcigit and Ates (2023) delve into the rising market concentration and business dynamism slowdown in the U.S., and find that the decline in business dynamism is driven by a decline in the rate of knowledge diffusion. They hypothesize that the decline in knowledge diffusion is due to the heavy use of intellectual property rights by large firms, a specific type of barrier to entry.

Covarrubias et al. (2020) explores the increase in industrial concentration in the US, distinguishing between "good" concentration driven by market forces and "bad" concentration arising from rising barriers to competition. They amply document the rise in concentration in the US economy, and find that the increase in concentration was driven by innovation and productivity growth in the 1990s, but that it has been driven by other factors since the mid-to-late 2000s. Their findings motivate our theoretical framework, which allows us to distinguish between industries where concentration is driven by innovation and those where it arises due to other factors.

Regarding the nascent Macroeconomic Market Power literature, Syverson (2019) reviews the body of work and warns against simplistic comparisons between concentration and market power, emphasizing the importance of distinguishing between the two and discussing the potential pitfalls of using concentration as a proxy for market power, while also highlighting the importance of understanding the underlying causes of the observed trends, as well as their implications for the economy. Loecker and Eeckhout (2018) study the evolution of markups in the US economy, and find that markups have dramatically increased since 1980, driven by the rightmost tail of the markup distribution, as well as by the reallocation of market shares towards high markup firms. Autor et al. (2020b) link the decline in the labor share to the rise of superstar firms and discuss the implications for market power. Gourio et al. (2016) find that shocks to firm entry at the state level can have persistent effects on macroeconomic variables. I extend this line of research by studying the impact of political contributions on concentration. While the literature has focused on the impact of entry costs on concentration, I explore the role of political contributions, which can be used to erect barriers to entry and influence the regulatory environment in which firms operate.

## 2.2. Theory

**Setup.** Consider an industry with aggregate demand $Y$ and $N$ firms. Time is discrete and indexed by $t$. Firm $i$'s productivity is denoted by $a_i$. Operation entails a fixed cost $\phi$, which captures both the "natural" costs associated with operation, as well any "artificial" overhead cost created as a result of regulatory burden on firm operation. In a later section I will consider the case where Special Interest Groups (SIGs) lobby to influence the level of regulation in this industry, which will be reflected in the value of $\phi$. Firm $i$ charges a markup over marginal cost of $\mu_i$. The markup $\mu_i$ might be the result of monopolistic competition, or it might be the result of strategic behavior by firms[3]. Let $y_i$ be the output produced by firm $i$. Per-period profits are given by[4]:

$$\pi_i = \left(\frac{\mu_i}{1+\mu_i}\right) p_i y_i - \phi \tag{2.1}$$

I consider the benchmark case with no firm heterogeneity, which allows us to focus on the simplest notion of concentration, total output over the number of firms $N$, an *intensive margin*. I then extend the model to consider the case of heterogenous firms, which allows us to study movements in the threshold productivity level $a^*$, the productivity level below which firms are unable to survive in the industry, an *extensive margin*.

**Firm Entry and Exit.** Each period, a fraction $\delta$ of firms exogenously exits the industry and gets replaced by a new cohort of entrants. Before drawing their productivity level and starting operation firms must first pay an entry cost $\kappa$, which captures both the "natural" costs associated with "setting up shop", as well as any overhead cost created as a result of regulation. Similarly to the case of operating costs, $\kappa$ will be a natural object of interest in the context of SIGs lobbying to influence the level of regulation in this industry. Free entry, conditional on paying the entry cost, effectively drives net expected profits to zero:

$$\mathbb{E}\sum_{t=0}^{\infty}(1-\delta)^t \pi_i - \kappa = \frac{\mathbb{E}[\pi_i]}{\delta} - \kappa = 0 \tag{2.2}$$

**No Heterogeneity.** Suppose that all firms are identical, so that $a_i = a$, $\mu_i = \mu$ and $y_i = y = Y/N$ for all $i \in [0,\ldots,N]$. Combining (2.1) with (2.2) and assuming that aggregate industry demand is isoelastic and follows $Y = \bar{Y}/p$, where $\bar{Y}$ is total industry expenditure

[3] I remain agnostic on the source of this mark-up. For a discussion on the different sources of markups in the context of these models, see Peters (2020),Markusen (2023), or Melitz and G. I. P. Ottaviano (2008).

[4] Start with the definition for profits $\pi_i = \left(p_i - \frac{1}{a_i}\right) y_i - \phi$, where $p_i = (1+\mu_i)/a_i$ is the price charged by firm $i$. Multiplying marginal cost $1/a_i$ by $p_i/p_i$, expanding and rearranging terms yields the expression in (2.1).

and $p$ is the price charged by firms in the industry, I can use the free entry condition to solve for the number of firms in the industry $N$:

$$N = \left(\frac{\mu}{1+\mu}\right)\left(\frac{\bar{Y}}{\delta\kappa + \phi}\right)$$

The parameters $\kappa$ and $\phi$ capture both the "natural" costs associated with entering and operating in this industry, as well any overhead cost created as a result of regulation. In particular, these two parameters capture any costs associated with barriers to entry, such as licensing requirements, zoning laws, or any other regulation that makes it difficult for firms to enter an industry. Immediately, I can see that an increase in $\kappa$ or $\phi$ increases concentration by reducing the number of firms in the industry. This is a form of *regulatory capture*, in the sense that if an SIG is able to influence the level of regulation in this industry to its benefit, this will be reflected in an increase in concentration.

How could an SIG influence the level of regulation in this industry? Lobbying is a natural candidate. I can think of political contributions as a form of lobbying, where a single or multiple SIGs contribute to political campaigns in order to influence the regulatory environment in their favor. Then the fixed cost of entry $\kappa$ and operation $\phi$ are composed of two parts, a "natural" component, and a "political" component, which captures the effect of lobbying on the regulatory environment, so that $\kappa = \bar{\kappa}(1+\kappa_{pol})$ and $\phi = \bar{\phi}(1+\phi_{pol})$. I do not explicitly model the lobbying process, although I think of $\kappa_{pol}$ and $\phi_{pol}$ as the result of the SIG's lobbying efforts, and hence functions of the SIG's lobbying expenditures.

Equation (2.2) also exemplifies the main difficulty in using concentration as a proxy for market distortions. Consider a decrease in markups $\mu$, a signed of increased competition. The effect is a decrease in the number of operating firms, and thus an increase in concentration, implying that concentration and competition are positively correlated in this case. Since concentration is an endogenous outcome, it is difficult to disentangle the economic mechanisms (potentially reflected in parameters $\mu$, $\delta$ or $\bar{Y}$) from political ones (potentially reflected in parameters $\kappa$ and $\phi$). I introduce firm heterogeneity to the model to help us disentangle these two effects.

**Heterogenous Firms.** Each firm $i$ produces a differentiated variety of the same good with productivity $a_i$ and charges a markup over marginal cost of $\mu_i = \mu(a_i)$. The price charged by firm $i$ is $p_i = {(1+\mu_i)}/{a_i}$.

Consumer preferences follow a Dixit-Stiglitz CES aggregator with elasticity of substitution $\sigma$. The bundled good is $Y = \left(\int_0^N y_i^{(\sigma-1)/\sigma}\right)^{\frac{\sigma}{\sigma-1}}$, the price index is $P = \left(\int_0^N p_i^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$ and the demand for variety $i$ is $y_i = Y\left(\frac{p_i}{P}\right)^{-\sigma}$. Plugging the demand function and the price charged by firm $i$ into the expression for profits in equation (2.1), I have that firm $i$'s profits are given by

$$\pi_i = \left(\frac{\mu_i}{1+\mu_i}\right) p_i \left(\frac{p_i}{P}\right)^{-\sigma} Y - \phi = \frac{\mu_i}{(1+\mu_i)^{\sigma}} a_i^{\sigma-1} P^{\sigma} Y - \phi$$

I continue to abstract from firm behaviour and regard the markup $\mu(a_i) = \mu$ as an exogenous parameter that captures the level of competition[5]. Firm heterogeneity and fixed production costs imply that there is a threshold productivity level $a^*$ such that firms with $a_i < a^*$ exit the industry. Let $F$ be the cumulative distribution function of $a_i$, so that the share of firms with productivity above $a^*$ is $1 - F(a^*)$. Then the productivity distribution of active firms is given by $\frac{dF(a)}{1-F(a^*)}$.

**The Price Index and Average Industry Productivity.** Expanding the expression for the price firm $i$ charges, industry's price index is

[5]In particular note that $1 + \mu_i = {\sigma}/{\sigma-1}$ for the case of monopolistic competition.

$$P = \left(\int_0^N p_i^{1-\sigma} di\right)^{\frac{1}{1-\sigma}} = \left(\int_{a^*}^{a_N} \left(\frac{1+\mu}{a_i}\right)^{1-\sigma} \frac{NdF(a)}{1-F(a^*)}\right)^{\frac{1}{1-\sigma}}$$
$$= \frac{1+\mu}{N^{\frac{1}{\sigma-1}}} \left(\int_{a^*}^{a_N} a_i^{\sigma-1} \frac{dF(a)}{1-F(a^*)}\right)^{\frac{-1}{\sigma-1}} = \frac{1+\mu}{A^* N^{\frac{1}{\sigma-1}}} \tag{2.3}$$

Where $A^* = \left(\int_{a^*}^{a_N} a_i^{\sigma-1} \frac{dF(a_i)}{1-F(a^*)}\right)^{\frac{1}{\sigma-1}}$ is a weighted average of the productivity of firms in the industry. The price index is decreasing in the number of firms, in the elasticity of substitution between varieties, in the industry's average productivity, and increasing in the markup. A more competitive industry is associated with a lower price index.

**The Zero Profit Cutoff Condition.** Write the expression for the profits of a firm with productivity $a_i$ as a function of the industry's price index and the number of firms in the industry:

$$\pi_i = \frac{\mu}{(\mu+1)^\sigma} a_i^{\sigma-1} P^\sigma Y - \phi = \frac{\mu}{(\mu+1)^\sigma} a_i^{\sigma-1} P^{\sigma-1} PY - \phi$$
$$= \frac{\mu}{(\mu+1)^\sigma} a_i^{\sigma-1} \left[\frac{1+\mu}{A^* N^{\frac{1}{\sigma-1}}}\right]^{\sigma-1} PY - \phi$$
$$= \frac{\mu}{(\mu+1)} \left[\frac{a_i}{A^*}\right]^{\sigma-1} \frac{PY}{N} - \phi \tag{2.4}$$

Assume that total industry expenditure $\bar{Y} = PY$ is constant. Set equation (2.4) equal to zero and define $a^*$ such that $\pi_i = 0$ for $a_i = a^*$. Rearranging, I have :

$$\left(\frac{\mu}{\mu+1}\right)\left(\frac{\bar{Y}}{N}\right) = \phi \left[\frac{A^*}{a^*}\right]^{\sigma-1} \tag{2.5}$$

where $a^*$ is the lowest productivity level such that firms earn non-negative profits.

Equation (2.5) is known as the Zero Profit Cutoff condition (ZPC) for the industry.

**Firm Entry and Exit with Heterogeneity.** Define the average profit $\bar{\pi}$ as the expected profit of a firm conditional on successful entry.

By definition[6]:

$$\begin{aligned}
\bar{\pi} = \mathbb{E}[\pi_i|\pi_i > 0] &= \int_{a^*}^{a_N} \pi(a) \frac{dF(a)}{1 - F(a^*)} \\
&= \int_{a^*}^{a_N} \left[ \frac{\mu}{(\mu+1)} \left( \frac{a}{A^*} \right)^{\sigma-1} \frac{\bar{Y}}{N} - \phi \right] \frac{dF(a)}{1 - F(a^*)} \\
&= \frac{\mu}{(\mu+1)} \frac{\bar{Y}}{N A^{*\sigma-1}} \int_{a^*}^{a_N} a^{\sigma-1} \frac{dF(a)}{1 - F(a^*)} - \phi \\
&= \frac{\mu}{(\mu+1)} \frac{\bar{Y}}{N} - \phi
\end{aligned} \tag{2.6}$$

Free entry implies that the value of a firm net of the fixed cost of entry is driven to zero by entrants. Firm value is the present value of the expected profit stream times the probability of drawing a high enough productivity level $a_i$ to enter the industry, minus the fixed cost of entry $\kappa$. Substituting the expression for $\bar{\pi}$ from equation (2.6) and rearranging terms yields the Free Entry Condition (FEC):

$$\begin{aligned}
\frac{[1 - F(a^*)]\, \mathbb{E}[\pi_i|\pi_i > 0]}{\delta} - \kappa = 0 \\
\left( \frac{\mu}{1+\mu} \right) \left( \frac{\bar{Y}}{N} \right) = \frac{\kappa \delta}{1 - F(a^*)} + \phi
\end{aligned} \tag{2.7}$$

**Equilibrium and Analysis.** Equating (2.7) and (2.5) implicitely defines the equilibrium low productivity level $a^*$ and the number of firms in the industry $N$:

[6]The 4th equality follows from integrating from $a^*$ to $a_N$, using the fact that $F(a_N) = 1$, the definition of $A^*$, and rearranging terms.

$$\left[\frac{A^*}{a^*}\right]^{\sigma-1} = \frac{\kappa\delta}{\phi[1-F(a^*)]} + 1 \tag{2.8}$$

Let us first consider an increase in to the elasticity of substitution $\sigma$, reflecting an increase in competition (Melitz, 2003b). Focusing on equation (2.8), I can see that this results in an increase in the threshold productivity level $a^*$. Intuitively, a higher $\sigma$ implies a higher level of competition in the industry, which reallocates market activity towards more productive firms and results in the exit of the least-productive firms, an *extensive margin* effect. Using either equilibrium condition, I can see that this results in a lower number of firms in the industry $N$, so that industry concentration increases, akin to an *intensive margin* effect in scenarios with no firm heterogeneity. Unlike situations with uniform firm behavior, this effect predominantly impacts the least productive firms, compelling their exit from the industry. Furthermore, a heightened $a^*$ diminishes the likelihood of successful entry $1-F(a^*)$, so that both entry and exit dynamics are affected by an increase in $\sigma$. When considering a technological innovation that boosts the highest productivity level ($a_N$), thereby elevating the average productivity ($A^*$), the market dynamic mirrors that of an increased $\sigma$, steering market activity towards the more productive firms. In these scenarios, the resultant increase in concentration is an innate outcome of market mechanisms favoring more productive firms. Here, heightened concentration signals a market that is both innovative and competitive, driven by endogenous forces.

**Regarding Endogenous Markups** The consideration of endogenous markups necessitates distinguishing the impacts of changes in the firm count (N) from those on firm-specific markups. While markup variations due to N shifts uniformly affect all firms, individual firm markup adjustments predominantly advantage the most productive firms. Although our analysis has treated markups as constant for simplicity and in alignment with the ubiquitous CES demand system, real-world markups are influenced by numerous factors and are documented to be far from constant (De Loecker et al., 2016). A comprehensive model incorporating flexible markups that increase in firm size would require a household sector with subconvex preferences (Mrázová et al., 2021), which is beyond the scope of this study[7]. Nevertheless, the implications of subconvex demand systems are relevant for our analysis, as they suggest that in markets with subconvex demand, an increase in concentration is associated with a rise in markups, an effect which stems from the reallocation of market activity towards larger firms, as opposed to a uniform increase in markups across all firms. Our empirical analysis suggests this perspective. While we cannot observe markups, we do observe a reallocation of economic activity away from middle-sized firms towards the tails of the firm size distribution, in particular towards the largest firms. Under the assumption of subconvex demand, the observed shifts in economic activity would imply increasing aggregate or industry-level markups, consistent with the empirical findings of Baqaee and Farhi (2019).

**Political Economy.** Consider an increase in the fixed cost of entry $\kappa$. A higher $\kappa$ makes it more expensive for new firms to enter the industry. At the same time, *conditional on paying the entry fee* , a higher $\kappa$ lowers the threshold productivity level $a^*$, making it easier for firms to survive in the industry and *lowering* the average productivity level $A^*$. I claim that this is a sign of a politically captured market, where SIGs lobby to increase the fixed cost of entry $\kappa$ in order to protect incumbent firms from competition. In this particular case, concentration at the right tail of the productivity distribution decreases, as the least-productive firms are protected from competition and are able to artificially survive in the industry.

Finally, consider an increase of $\phi$ on an incumbent firm's profits. Taking the deriva-

[7] In Mrázová et al. (2021), the authors generalize the CES demand system to a family of demand systems the authors to as “Constant Revenue Elasticity of Marginal Revenue” (CREMR) demands. A subset of these demands, those that are “less convex” than CES, or *subconvex*, yield markups that increase with firm size.

tive of equation (2.4) with respect to $\phi$, and rearranging terms, I get

$$\frac{\partial \pi}{\partial \phi} = \frac{\mu}{(\mu+1)} a^{\sigma-1} \bar{Y} \frac{\partial}{\partial \phi} \left( \frac{1}{(A^*)^{\sigma-1} N} \right) - 1 \tag{2.9}$$

From the equilibrium condition (2.8) I know that $a^*$ is increasing in $\phi$, implying that for a sufficiently productive firm, $\frac{\partial \pi}{\partial \phi} > 0$.

Big firms have an incentive to lobby for whatever policy that makes it more difficult for other firms to enter or survive in the industry.[8]. While in this case there is a productivity increase because of the exit of the least-productive firms, this is a "fake" productivity increase, in the sense that it is not the result of a technological innovation that makes firms more productive, but rather the result of a political economy distortion that reallocates market activity towards bigger firms, at the expense of smaller firms.

Intuitively, while concentration is an endogenous outcome, it is also a natural object of interest in the context of political economy distortions. When concentration increases, I want to know whether this is the result of market forces reallocating market activity towards more productive firms following a change in either competition or a technological innovation, or whether this is the result of political economy distortions that reallocate market activity towards bigger firms, at the expense of smaller firms.

## 2.3. Data

**Firm employment data.** Our primary data source is the Business Dynamics Statistics (BDS), provided by the US Census Bureau. The dataset encompasses crucial information related to the distribution of firms in terms of size and age, as well as entry and exit rates, for each industry and state in the US at different levels of aggregation. I use two national-level tables with information on the number of firms, employment, and establishments, categorized by firm size in one table and by firm age in the other, for each

[8] I use "lobby" in the broad sense of the word, where an SIG exerts effort to sway policy in its favor.

industry at the 3-digit NAICS level. Both tables feature 10 firm size and age categories, so that each row represents a specific industry, year, and firm size or age category.

I also use the extended version of the County Business Patterns (CBP) dataset introduced by Eckert et al. (2020), which provides similar information to the BDS dataset, albeit at the county level at the 4-digit NAICS level but without reference to firm size nor age. I use their dataset to compute industry-specific weights for each state, their *geographical* distribution, necessary for the construction of the instrumental variables used in our analysis. Both the BDS and the CBP datasets range from the late 70s to 2020, although I focus our analysis on the period of 1992 to 2020, as this is the period for which I have data on political contributions.

**Campaign Finance.** The data on political contributions comes from OpenSecrets, from their Campaign Finance data tables, which synthesize information from the Federal Election Commission (FEC) on political contributions for federal-level campaigns. They cover each campaign cycle from 1990 to 2020 (OpenSecrets, 2021). Campaign cycles in the US are defined as the two-year period between elections, and can be either presidential or midterm. Each campaign cycle has an associated set of 5 data tables from OpenSecrets, of which I use those concerned with Individual, and Political Action Committee (PAC) contributions, as well as those with committee and candidate information. Political contributions in the United States can be made through a variety of channels, which can be broadly categorized as either “direct” contributions, also known as “hard money”, contributions made directly to a candidate or party, or “indirect” contributions, also known as “soft money”, contributions made withouth direct coordination with a candidate or party. Similarly, contributions can be made for a variety of reasons, which can be broadly categorized as either “Business”, which are contributions made by corporations, businesses, or individiuals with business interests, “Labor”, which are contributions made by labor unions or individuals with labor interests, and “Ideological”, which are contributions made by individuals or organizations with non-business and non-labor interests, such as environmental groups, civil rights organizations, or other non-profit organizations. Examples of business contributions include those made by "Soros Fund Management", "Citadell LLC", or "Blackstone Group". Labor contributions are made by organizations such that represent workers or labor interests, such as the "International Brotherhood of Electrical Workers" and the "United Food & Commercial Workers Union". Ideological contributions are made by organizations that are not primarily focused on business or labor interests, but are highly partisan or have a specific policy agenda. Popular issues in this category include abortion rights, gun control, or environmental protection. Examples of ideological contributions include those made by the "EMPOWER PARENTS PAC" or the "Everytown For Gun Safety Action Fund".

**Production Data.** Our analysis leverages the "Integrated Industry-level Production Account for the United States" dataset, a joint effort between the Bureau of Economic Analysis (BEA) and the Bureau of Labor Statistics (BLS). This dataset joins together industry-level output and intermediate inputs from the BEA's "Gross Domestic Product (GDP) by Industry" accounts with capital and labor data from the BLS, in order to create a dataset of productivity, input and output growth at the industry levels that is consistent with the BEA's industry-level accounts. The granularity of this dataset, encompassing 63 industries spanning the entire economy and disaggregated input measures, provides a precise measure of (integrated) Total Factor Productivity (TFP) growth by industry. Particularly relevant to this study are the dataset's tables on TFP, Value Added (VA), and Gross Output (GO) at the industry level (Eldridge et al., 2020; Garner et al., 2020). Unlike manufacturing, where outputs and inputs are more tangibly assessed, sectors like transportation and retail trade present unique complexities due to the heterogeneity of their outputs and the multifaceted nature of their operations. The BEA-BLS account addresses these challenges by incorporating approximately 170 different worker types by industry and about 100 types of capital assets, including inventories and land. This level of detail allows a more accurate measurement of industry-specific TFP growth, accommodating the distinct characteristics inherent to various sectors (Garner et al., 2020). The methodology and data sources employed in the BEA-BLS integrated account follow the growth accounting framework posited by Gollop et al. (1987) By decomposing growth in industry gross output into contributions from growth in intermediate inputs, capital, labor, and TFP, where TFP is defined as the residual growth in output that cannot be attributed to growth in inputs. This approach not only caters to manufacturing but to the whole private U.S.'s economy.

**Import Data.** Import-related data is the same as Schott et al. (2008). This dataset contains information on the value of imports (exports) from (to) all countries of origin (destination) to (from) the US, at the 10-digit Harmonized System (HS) level, for the period 19892021 (Schott et al., 2008). Together with data on Gross Output from the BEA, I use this dataset to compute import penetration rates at the industry level.

**Final Dataset** I merge the variables merges the variables from the BDS, OpenSecrets, and BEA-BLS datasets, as well as the import data, on a 3-digit NAICS x year basis. It covers the period from 1992 to 2020, corresponding to 15 political cycles, as well as 56 industries at the 3-digit NAICS level, for a total of 825 observations. I use the following variables:

- **Top Employment Share (TES):** Share of employment held by firms with more than 2500 employees within an industry in a given year. Percentage.
- **Bottom Employment Share (BES20 and BES100):** Share of employment held by firms with less than 20, and less than 100, employees, respectively, within an industry in a given year. Percentage.
- **Middle Employment Share (MES):** Share of employment held by firms with between 100 and 2500 employees within an industry in a given year. Percentage.
- **Share of Contributions (CShare):** Industry *i*'s share of all business-related con-

tributions during a political cycle. Percentage

- **Contributions (C)** Industry *i*'s total contributions during a political cycle.
- **Indirect Contributions (IC):** Share of industry contributions contributed as *soft money*. Percentage.
- **Average Firm Size (FSize):** Weighted average of firm size per industry, in number of employees, in a given year.
- **Total Factor Productivity (TFP):** Index of Total Factor Productivity at the industry level. Base year 2012.
- **Value Added (VA):** Value Added at the industry level. Millions of US Dollars.

The thresholds for firm size are not chosen arbitrarily, but rather follow the BDS's size categories, which can be found in Appendix 2.A.1. For example, the threshold for large firms is set at 2500 employees, which corresponds to the firm size categories "h, i, j" in the BDS dataset. The thresholds for firm size follow the BDS's size categories, which can be found in Appendix 2.A.1.

## 2.4. Empirical Analysis

### 2.4.1 Employment Share per Firm Size Category

The empirical analysis starts with a reduced-form model of the share of employment held by firms of different size categories, as a function of the share of contributions made by an industry, as well as other industry-level covariates. The model is estimated using the following regression equation:

$$y_{it} = \beta_0 x_{i,t-1} + \beta_1 \text{BCRA}_{it-1} \times x_{i,t-1} + \beta_2 \text{PostBCRA}_{it-1} \times x_{i,t-1} + \beta_3 \Gamma_{it} + \epsilon_{it} \tag{2.10}$$

Where $y_{it}$ represents the share of an industry's employment held by firms within a certain size category. I focus on four firm size categories - BES20, BES100, MES, and TES, as described in Section 2.3 - which together encompass the entirety of each industry's firm size distribution. Industries are defined at the 3-digit NAICS level, and observations are at the industry ($i$) and political cycle ($t$) level. The covariate of interest, $x_{it}$, is the share of contributions donated by industry $i$, out of the total amount of contributions made in political cycle $t$ (CShare). I hypothesize that the share of contributions made by an industry is a better proxy for its political influence than the total amount of contributions made by an industry, as it reflects the relative importance of an industry in the political arena on a given election cycle, from the point of view of the political establishment. In order to account for the legislative changes that took place in the early 2000s, which significantly altered the regulatory framework governing political contributions, I introduce two dummy variables corresponding to the BCRA period (2002–2010) and the post-BCRA period (2012–2020). These dummies are interacted with the covariate of interest to discern the relative influence of each period on the relationship between $x_{it}$ and $y_{it}$. The vector of control variables $\Gamma_{it}$ encompasses factors crucial for refining the analysis, including Total Factor Productivity (TFP), the natural logarithm of a weighted average of industry firm size, and value added. It includes industry and cycle fixed effects, in order to account for industry-level heterogeneity and period-specific effects. The results are presented in Table 2.1 below.

Results in Table 2.1 show that an industry's share in federal election campaign contributions and the distribution of employment across firm size categories is statistically significant. I find a positive and statistically significant correlation between the share of contributions and the share of employment of big firms, and a negative and statistically significant correlation between the share of contributions and the share of employment of medium-sized firms. The evidence suggests a shift in employment away from mid-sized firms, those with more than 100 but less than 2500 employees, towards both the upper tail of the firm size distribution, indicating a potential reallocation of economic activity towards big firms.

| Regression | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | y = TES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | |
| CShare | 1.556*** (0.54) | 1.409** (0.568) | 0.126 (0.243) | -0.246 (0.249) | -1.163** (0.574) |
| BCRA*CShare | -0.276** (0.129) | -0.24* (0.135) | -0.04 (0.082) | 0.078 (0.074) | 0.163 (0.154) |
| PostBCRA*CShare | 0.11 (0.205) | 0.135 (0.21) | -0.114 (0.165) | -0.079 (0.15) | -0.056 (0.199) |
| BCRA | 0.302 (0.457) | | | | |
| PostBCRA | -0.809 (0.703) | | | | |
| log (FSize) | 19.262*** (2.533) | 19.446*** (2.659) | -12.943*** (1.398) | -19.93*** (1.532) | 0.484 (2.813) |
| TFP | -0.026 (0.027) | -0.028 (0.028) | 0.01 (0.017) | 0.019 (0.017) | 0.009 (0.025) |
| VA | 3.40e-06*** (1.15e-06) | 3.07e-06*** (1.18e-06) | -1.71e-06*** (5.26e-07) | -2.33e-06*** (7.68e-07) | -7.38e-07 (1.41e-06) |
| R-squared | 0.484 | 0.475 | 0.702 | 0.738 | 0.022 |
| Observations | 825 | 825 | 825 | 825 | 825 |
| Included Effects | Entity | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
* p < 0.1, ** p < 0.05, *** p < 0.01. Standard Errors in parentheses.

**Table 2.1** – Baseline Regression Results.

Contrary to expectations, Total Factor Productivity (TFP) does not emerge as a significant determinant for employment shares, as indicated by its non-significant coefficient. This finding implies that factors beyond productivity are at play in shaping the firm size distribution. On the other hand, the value-added and firm size display a significant impact, highlighting their critical role in influencing the concentration of labor in larger firms, underscoring the considerable weight of firm size and industry scale in determining employment distribution within industries.

The interaction terms, BCRA*CShare and PostBCRA*CShare, do not exhibit statistical significance across most regressions. This lack of significance suggests that the role of political contributions, as modulated by the BCRA legislation and its aftermath, is not decisively influential in altering the firm size distribution. However, the notable exception is the BCRA*CShare interaction for TES, which does present significance, with the expected negative sign. This finding suggests that the BCRA potentially had a negative impact on the effectiveness of political contributions as a rent-seeking mechanism, as it limited the amount of money that could be donated to political campaigns. As can be seen in Figure 2.2, the amount of indirect contributions plummeted following the BCRA, although direct contributions continued to increase, suggesting at least a partial substitution of indirect contributions for direct contributions.

**Evidence from TFP**

The theoretical model illustrates how industry concentration can be driven by both economic forces, such as productivity and an industry's competition level, as well as by non-economic factors like rent-seeking. The role played by political contributions fits squarely in the latter category. To account for the former, I perform two analyses. First, I group industries based on whether yearly TFP is positively correlated with the share of employment of big firms, signalling a productivity-driven increase in concentration. In line with the nomenclature introduced in Covarrubias et al. (2020), I refer to them as "Good Concentration" industries, and identify them using the variable $\text{G}_i$, which takes the value of 1 if the correlation between TFP and the share of employment of big firms is positive, and 0 otherwise. I contrast them with "Bad Concentration" industries, where TFP is not positively correlated with the share of employment of big firms. I modify the baseline regression model to include this dummy variable, and estimate the model on the full sample of industries. The regression model is:

$$\begin{aligned} y_{it} = \beta_0 x_{i,t-1} + \beta_1 \text{G}_i \times x_{i,t-1} + \beta_2 \text{BCRA}_{it} \times x_{i,t-1} + \beta_4 \text{G}_i \times \text{BCRA}_{it} \times x_{i,t-1} \\ \beta_5 \text{PostBCRA}_{it} \times x_{i,t-1} + \beta_6 \text{G}_i \times \text{PostBCRA}_{it} \times x_{i,t-1} + \beta_7 \Gamma_{it} + \epsilon_{it} \end{aligned}$$

Afterwards, I estimate the baseline regression model on each subsample, and compare the results. Results are presented in Table 2.2, for the full sample, and in Table 2.3, for each subsample. In both subsamples, the correlation between *CShare* and the firm size distribution is robust, with a notably stronger correlation in the “Bad Concentration” subsample for both TES and MES. This distinction emphasizes the nuanced impact of political contributions across different productivity contexts, with the “Bad Concentration” subsample exhibiting a stronger correlation between contributions and concentration at the top of the firm size distribution.

Interestingly, the relationship between TFP and TES diverges between the subsamples, being negatively correlated in the “Bad Concentration” group and positively in the “Good Concentration” group, although only reaching statistical in the former but not the latter. This variation offers insight into the previously observed non-significance of TFP in the baseline model, suggesting that contrasting influences of productivity on employment shares in different industry types may be neutralizing each other in aggregate analyses. Additionally, the VA exhibits statistical significance exclusively in the “Good Concentration” subsample, suggesting that the role of value-added in influencing the firm size distribution is more pronounced in industries where productivity is positively correlated with concentration, as opposed to industries where concentration is driven by other factors, Overall, these findings validate the baseline results and enrich our understanding by showing how the relationship between productivity and other economic fundamentals *are not* the only drivers of concentration, and that the role of political contributions is indeed more pronounced in such industries where these economic fundamentals are not the main drivers of concentration.

| Regression | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | y = TES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | |
| CShare | 2.522** (1.197) | 2.416* (1.284) | 0.032 (0.292) | -0.404 (0.371) | -2.012* (1.119) |
| G*CShare | -1.907 (1.399) | -2.025 (1.485) | 0.297 (0.619) | 0.455 (0.622) | 1.57 (1.321) |
| BCRA*CShare | -0.47* (0.241) | -0.438* (0.253) | -0.033 (0.054) | 0.081 (0.069) | 0.357 (0.244) |
| G*BCRA*CShare | 0.463* (0.278) | 0.475 (0.294) | -0.017 (0.208) | 0.011 (0.13) | -0.486 (0.3) |
| PostBCRA*CShare | 0.322* (0.187) | 0.349* (0.193) | -0.1 (0.093) | -0.076 (0.11) | -0.273 (0.2) |
| G*PostBCRA*CShare | -0.186 (0.29) | -0.163 (0.304) | -0.073 (0.355) | -0.065 (0.269) | 0.228 (0.273) |
| BCRA | 0.222 (0.467) | | | | |
| PostBCRA | -0.894 (0.706) | | | | |
| log (FSize) | 19.213*** (2.534) | 19.399*** (2.657) | -12.96*** (1.409) | -19.949*** (1.532) | 0.55 (2.814) |
| TFP | -0.026 (0.027) | -0.028 (0.028) | 0.01 (0.017) | 0.019 (0.017) | 0.009 (0.025) |
| VA | 3.43e-06*** (1.17e-06) | 3.06e-06** (1.20e-06) | -1.70e-06*** (5.51e-07) | -2.32e-06*** (7.72e-07) | -7.41e-07 (1.42e-06) |
| R-squared | 0.491 | 0.482 | 0.703 | 0.739 | 0.035 |
| Observations | 825 | 825 | 825 | 825 | 825 |
| Included Effects | Entity | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level.
Dummies for the BCRA and Post-BCRA periods, as well as for industries where TFP is correlated with TES.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table 2.2** – Baseline Regression Results augmented with a dummy for industries where TFP is correlated with TES.

| | Negative TFP-TES Correlation | | | | | Positive TFP-TES Correlation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | y = TES | y = TES | y = BES20 | y = BES100 | y = MES | y = TES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | | | | | | |
| CShare | 2.162* (1.139) | 2.159* (1.173) | 0.099 (0.418) | -0.083 (0.448) | -2.077* (1.125) | 1.368** (0.567) | 1.132** (0.568) | 0.549 (0.638) | 0.079 (0.596) | -1.211* (0.66) |
| BCRA*CShare | -0.321 (0.327) | -0.336 (0.359) | -0.078 (0.16) | -0.113 (0.139) | 0.449 (0.445) | -0.45** (0.208) | -0.394* (0.213) | -0.142 (0.296) | 0.156 (0.195) | 0.238 (0.281) |
| PostBCRA*CShare | 0.444 (0.509) | 0.405 (0.573) | -0.228 (0.282) | -0.436 (0.289) | 0.031 (0.67) | -0.404 (0.253) | -0.331 (0.251) | -0.2 (0.461) | 0.063 (0.36) | 0.268 (0.24) |
| BCRA | -1.304** (0.527) | | | | | 1.411* (0.739) | | | | |
| PostBCRA | -2.696*** (0.687) | | | | | 1.068 (1.029) | | | | |
| lnFSize | 13.872*** (2.469) | 13.899*** (2.822) | -13.678*** (1.484) | -20.957*** (1.564) | 7.058** (2.74) | 20.177*** (3.547) | 20.16*** (3.66) | -12.299*** (3.094) | -17.417*** (3.393) | -2.743 (3.186) |
| TFP | -0.096** (0.039) | -0.096** (0.042) | 0.012 (0.021) | 0.034 (0.021) | 0.062** (0.031) | 0.067 (0.043) | 0.053 (0.051) | -0.01 (0.019) | -0.03 (0.028) | -0.023 (0.04) |
| VA | 4.67e-06 (3.72e-06) | 4.90e-06 (4.24e-06) | -4.23e-07 (2.24e-06) | 4.54e-07 (2.13e-06) | -5.36e-06 (5.42e-06) | 2.34e-06*** (7.62e-07) | 1.80e-06** (7.38e-07) | -2.16e-06*** (6.22e-07) | -3.09e-06*** (8.34e-07) | 1.30e-06 (7.89e-07) |
| R-squared | 0.572 | 0.541 | 0.752 | 0.816 | 0.19 | 0.586 | 0.498 | 0.642 | 0.63 | 0.102 |
| Observations | 435 | 435 | 435 | 435 | 435 | 390 | 390 | 390 | 390 | 390 |
| Included Effects | Entity | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level.
Dummies for the BCRA and Post-BCRA periods.
The sample is divided into two subsamples based on whether industry *i*'s TFP the period 1989-2020 is positively or negatively correlated with TES.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

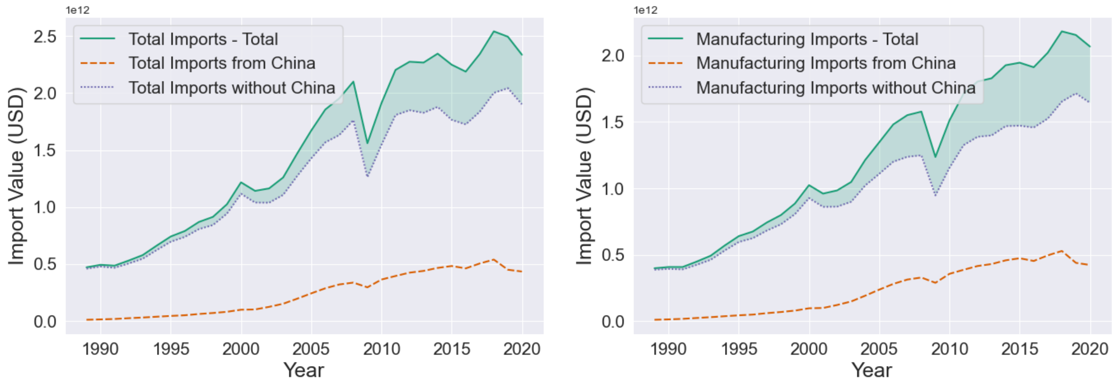
**Table 2.3** – Regression Results for the TFP-TES Correlation Subsamples.

### Evidence from the Manufacturing Sector

**Import Competition in US Manufacturing.** I turn the attention to the manufacturing sector and its response to increased import competition. Prior research has explored the relationship between import exposure and political behavior, linking it to increased political polarization (Autor et al., 2020a). Rather than using import competition as an instrument for contributions, I use it as a proxy for competition within an industry. The theoretical model predicts that the effects of import competition are most strongly felt by the least-productive firms.[9]. However, the exact link between import competition and concentration remains murky, with evidence that, accounting for foreign-based firm growth, traditional measures of concentration are rendered constant throughout the 90s and 2000s, suggesting that big manufacturing firms in the are negatively affected by import competition (Amiti and Heise, 2021). Figure 2.3 shows how imports evolved over time following China's accession to the WTO in 2001. Subfigure 2.3a displays the evolution of imports from China and the rest of the world across all industries, while Subfigure 2.3b focuses on the manufacturing sector in particular.

Figure 2.4 decomposes the evolution of average employment shares presented in the Introduction into two subfigures, one for manufacturing industries and one for non-manufacturing industries. Figure 2.4a shows the evolution of average employment shares for manufacturing industries, where I see that employment reallocated towards medium- and small-sized firms, mostly at the expense of big firms, throughout the 1990s and 2000s, although this trend seems to have reversed in the 2010s for big and small firms, with medium-sized firms continuing to steadily increase their share of employment. By contrast, Figure 2.4b shows a different pattern for non-manufacturing industries, where the share of employment of big (small) firms has steadily increased (decreased), while

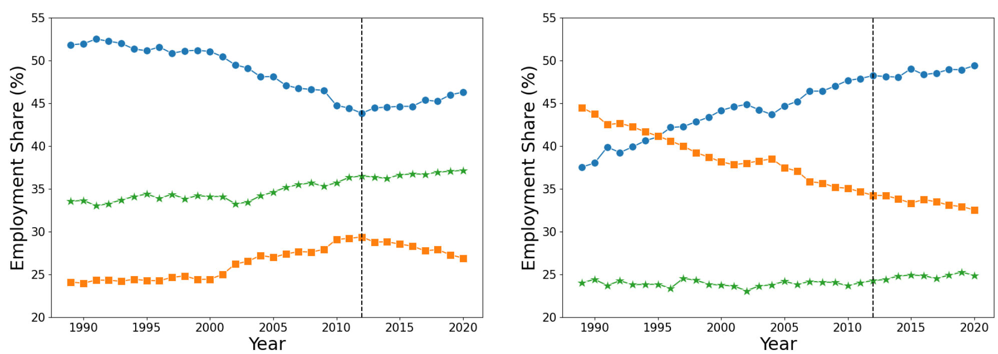
[9]Equation 2.8. This is also in line with the post-trade intra-industry adjustments explored in Melitz (2003a).




**(a)** Imports into the USA - Totals

**(b)** Imports into the USA - Manufacturing

**Figure 2.3** – The "China Shock" as the shaded area between both plots. Figure (a) shows import value into the USA in all sectors and Figure (b) shows import value into the USA in the manufacturing sector. The shaded area is the difference between total imports and imports from China. Both plots are in USD thousands of billions.




**(a)** Manufacturing industries

**(b)** Non-Manufacturing industries

**Figure 2.4** – Evolution of average within-industry employment shares for three firm size categories. Figure (a) on the left shows averages for manufacturing industries. Figure (b) on the right shows averages for non-manufacturing industries. Both figures show the average employment share of firms with more than 1000 employees (squares), firms with less than 1000 employees and more than 100 (balls), and firms with less than 100 employees (stars).

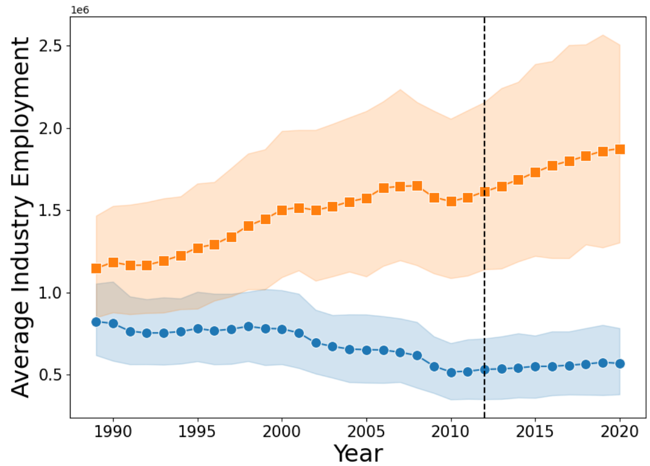



**Figure 2.5** – Evolution of average industry employment for manufacturing and non-manufacturing industries. The figure shows the evolution of average industry employment among industries within the manufacturing sector (balls), as well as among non-manufacturing industries (squares). The y-axis is in millions of employees.

the share of employment of medium-sized firms has remained remarkably stable. Figure 2.5 shows the evolution of employment levels in the manufacturing sector, which up until 2010 had steadily decline, and has since remained relatively stable. As observed in Autor et al. (2023), the manufacturing sector, which was relatively more concentrated before the 1990s compared to the rest of the economy, experienced a steady decline in concentration throughout the 1990s and 2000s, with a slight increase in concentration in the 2010s, while the rest of the economy experienced a steady increase in concentration since the 1990s.

**Penetration of Chinese Imports.** In order to control for the level of chinese import penetration, I compute each industry's Chinese import penetration ratio, defined as the ratio of chinese imports to the sum of domestic production and net imports from the rest of the world. I estimate the following regression model level:

$$y_{it} = \beta_0 x_{i,t-1} + \beta_1 \times \text{IPen CH} + \beta_2 \text{IPen CH} \times x_{i,t-1} + \beta_3 \Gamma_{it} + \epsilon_{it} \tag{2.11}$$

Where the vector of control variable $\Gamma_{i,t}$ includes entity and time fixed effects, as well as the same industry-level control variables used in the previous regressions.

The model is regressed on both the subsample of manufacturing industries and the full sample, with results presented in Tables 2.4. It is worth mentioning that the literature has documented Chinese import penetration to be associated with higher productivity. This result holds both for developed economies, including the United States, and for underdeveloped economies, such as those in Sub-Saharan Africa (Christian Darko and Vanino, 2021; Lind, 2022; Yahmed and Dougherty, 2017). Table A.19 in the Appendix shows the correlation between TFP and import penetration from China for each manufacturing industry in the sample over the period 1989-2020. Table A.18 from Appendix 2.B.1 presents the results of the regression without TFP as a control variable. The results are consistent with the results presented in Table 2.4, with the sole remarkable exception being that of the regression for TES among manufacturing industries, where the coefficient for CShare is decreases to 1.6 and becomes statistically insignificant. Given that the coefficient for the interaction term between CShare and IPen CH continues to be negative and statistically significant, and that rest of the results remain consistent, I conclude that the results are robust to the exclusion of TFP as a control variable.

In the regression with all industries, the coefficient on CShare is positive and statistically significant for the largest firms (TES), although its magnitude is noticeably lower compared to the regression with solely manufacturing industries. In the manufacturing sector, the coefficient on the interaction term between CShare and IPen CH is negative, suggesting that the effectiveness of political contributions in increasing the employ-

| | Manufacturing Industries | | | | All Industries | | | |
|---|---|---|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | y = TES | y = BES20 | y = BES100 | y = MES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | | | | |
| CShare | 2.138** (0.979) | 0.991*** (0.258) | 0.627 (0.525) | -2.765** (1.108) | 0.994* (0.57) | 0.175 (0.177) | -0.084 (0.2) | -0.91* (0.545) |
| IPenCH*CShare | -0.295*** (0.102) | -0.104*** (0.023) | 0.007 (0.037) | 0.288*** (0.07) | -0.073 (0.07) | -0.089*** (0.026) | -0.031 (0.026) | 0.104* (0.062) |
| IPen CH | 0.178*** (0.043) | 0.074*** (0.014) | 0.025 (0.023) | -0.203*** (0.037) | 0.113* (0.061) | 0.029 (0.023) | 0.002 (0.028) | -0.116** (0.05) |
| log (FSize) | 23.573*** (2.749) | -9.654*** (0.853) | -18.529*** (1.467) | -5.044* (2.764) | 21.805*** (2.841) | -12.66*** (1.699) | -20.009*** (2.036) | -1.796 (2.755) |
| TFP | 0.148** (0.058) | -7.79e-04 (0.011) | -0.042* (0.023) | -0.105** (0.042) | -0.029 (0.033) | 0.019 (0.019) | 0.022 (0.02) | 0.007 (0.03) |
| VA | -2.93e-07 (8.29e-06) | 2.54e-06* (1.43e-06) | 4.37e-06** (2.08e-06) | -4.08e-06 (8.23e-06) | 3.32e-06*** (9.44e-07) | -1.86e-06*** (4.65e-07) | -2.39e-06*** (6.35e-07) | -9.26e-07 (1.12e-06) |
| R-squared | 0.612 | 0.915 | 0.875 | 0.428 | 0.483 | 0.712 | 0.737 | 0.047 |
| Observations | 270 | 270 | 270 | 270 | 825 | 825 | 825 | 825 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle, IPen CH, the level of import penetration from China, and their interaction.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
The sample is divided into two subsamples based on whether industry *i*'s TFP the period 1989-2020 is positively or negatively correlated with TES.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table 2.4** – Baseline Regression Results augmented with the level of import penetration from China and its interaction with CShare.

ment share of large firms decreases as the level of import penetration from China increases. The overall effect for TES ranges from 2.138 (for zero import penetration) to 1.843 (for 80% import penetration, the maximum level in the sample, observed in the apparel manufacturing industry in 2014-2016).

Furthermore, within the manufacturing subsample, the coefficient on IPen CH is positive for TES and the smallest firms (BES20), and negative for medium-sized firms (MES). For MES, the coefficient on IPen CH is negative and statistically significant, while the coefficient on the interaction term between CShare and IPen CH is positive and statistically significant. The overall effect for MES ranges from -0.203 (for non-contributing industries) to 0.373 (for industries with the highest level of contribution shares in the sample). This result suggests that political contributions help alleviate the negative effects of import penetration on the employment share of medium-sized firms.

These findings indicate a reallocation of employment away from mid-sized firms towards both tails of the firm size distribution. This reallocation of economic activity could be masking the exit of small firms, potentially overshadowed by the downsizing of formerly medium-sized entities. Import penetration shows a protectionist trend, especially in the manufacturing sector, as evidenced by the negative and statistically significant interaction term between TES and the interaction of import penetration and relative contributions. This result suggests that political contributions from the manufacturing sector might be functioning as a protective measure, aiming to shield mid-sized firms from competitive pressures and counteracting the big-firm bias of contributions in industries with high import penetration. The sum of coefficients for TES (1.843) signifies that, on average, an increase in the share of total campaign contributions is positively associated with a larger employment share. However, this positive correlation is moderated by the level of import penetration from China, as indicated by the negative interaction term. In contrast, the sum of coefficients for MES (-2.477) indicates a strong negative association between campaign contributions and employment share, but the positive interaction term suggests that this negative effect is mitigated as import penetration increases.

### 2.4.2 Endogeneity Concerns

The primary endogeneity concerns in our study revolve around the potential for reverse causality and omitted variable bias. Reverse causality may arise if more concentrated industries can strategically contribute more to political campaigns, implying a bidirectional relationship. As our theoretical model illustrates, concentration is an equilibrium outcome determined by various market factors, including firm heterogeneity within industries. This underscores the concern for omitted variable bias, as myriad unobserved factors could drive concentration. While our aim is to identify the role of political contributions within these factors, unobserved parameters in the model could also influence concentration. In particular, our variable of interest, political contributions, is likely endogenous. Firms within an industry are strategic actors who consider market structure, the level of firm heterogeneity, and other factors when making contribution decisions. This endogeneity could bias our estimates if unobserved factors that influence political contributions are correlated with industry concentration. To mitigate these concerns, I have controlled for other potentially important variables and lagged political contributions by one political cycle. However, these measures may not be sufficient to fully address the endogeneity concerns. In the following section I discuss our strategy to construct an instrumental variable that can provide a more robust solution to these endogeneity challenges.

**Ideological Contributions as an Instrument**

Underlying the use of *relative* contributions as a proxy for political influence is the assumption that policymakers and SIGs interact *strategically*. The common-agency approach to SIG-government interactions is a natural way to think about their relationship, as it captures the basic idea that policy-makers have to juggle different, potentially competing, interests, including that of public welfare (Grossman and Helpman, 1996; Grossman and Helpman, 2002). One key prediction from this framework is that greater competition for influence among SIGs should lead to higher contributions, as SIGs attempt to increase their influence over policy-makers (Gawande and Bandyopadhyay, 2000b; Bombardini, 2008). Taking a look at the right hand side of Figure 2.2, I see that the share of contributions classified as ideological started to climb in the early 2000s, and experienced a dramatic increased following the Citizens United decision in 2010. Interpreting this surge in ideological contributions as a sign of increased competition for influence among SIGs, I expect that the surge in ideological contributions to have an impact on business-related contributions, as business SIG adjust their contribution schedules to account for the increased competition coming from ideological SIGs. In what follows, I exploit this surge in ideological contributions to construct an instrument for business-related contributions.

**Constructing the I.V.** In order to exploit the inter-industry variation in exposure, I construct a shift-share instrument that captures the share of each industry's exposure to state-level shifts in ideological contributions. To do so, I leverage *geographic* variation in ideological contributions and industry employment *across* states, as neither ideological contributions nor industry employment are uniformly distributed across states, and hence industries are "exposed" to different levels of ideological political competition. I use this "shift-share" instrument approach to compute the share of ideological contributions that each industry is exposed to. Our identification strategy relies on the assumption that industries' shares of employment across states is orthogonal to their level of concentration, and hence that the effect of state-level ideological shocks differentially affects industries based on their exposure to these shocks. This assumption is plausible, as the distribution of employment across states is likely to be driven by factors other than political contributions, such as labor costs, agglomeration economies, and other industry-specific factors. The shift-share instrument is constructed as follows: First, to compute state-level ideologically-motivated political donations, I trace each contribution within the OpenSecrets campaign finance datasets to a specific state, either using the address of the contributing party, for the case of individual contributions, or the legislative district of the recipient, for the case of PACs. Table A.4 in the appendix shows, in column 3, the per-cycle share of contributions that can be traced back to a state, with an average of 94.90% of contributions being traceable to a specific state in any given political cycle. Afterwards, I compute the distribution of employment across states for each 3-digit NAICS industry. These are the *shares* of our instrument. I am unable to trace contributions given to Presidential candidates coming from PACs, since they are by default not geographically link to any single state[10] For each political cycle, I compute each state's share of the surge in ideologically motivated political contributions, the *shift* of our instrument. Each industry will be exposed to a different

[10] This explains the drop in the share of contributions that can be traced back to a state in presidential election years, as shown in column 4 of Table A.4.

*share* of this shift, depending on the distribution of employment across states[11]. If, for example, an industry has a large share of employment in states that experienced a large surge in ideological contributions, then that industry will be exposed to a larger share of the surge in ideological contributions. By contrast, if an industry has a large share of employment in states that experienced a small or no surge in ideological contributions, then that industry will be exposed to a smaller share of the surge in ideological contributions. This construction is akin to the shift-share construction used in the literature on the effects of trade shocks on local labor markets, with the key distinction that, often, the explained variable varies across geography and time, while the explanatory variable in this study varies across industries and time. In general, when the unit of observation is at the geographic-temporal level, the shift-share instrument leverages the geographical units' variation in industry composition, and, accordingly, the shares in these studies usually represent each geographic unit's share of employment in a given industry. In this application, the shift-share instrument "reverses" the roles of the geographic and industry units, with the shares representing each industry's share of employment in a given geographic unit. This follows from the fact that the study is concerned with an industry-specific variable, industry-level concentration, and the variation in the explanatory variable is across industries and time.

Shares $\omega_{j,s,t}$ are computed as the share of employment of industry $j$ in state $s$ at time $t$, the shift is computed as the share of ideologically motivated contributions made in state $s$ at time $t$ relative to the total amount of ideologically motivated contributions made at the national level at time $t$, and the instrument itself is computed the dot product of these two variables, taken across all states:

$$\omega_{j,s,t} = \frac{E_{j,s,t}}{E_{j,t}}\ , \ Ideo_{s,t} = \frac{Ideo\_Contributions_{s,t}}{Ideo\_Contributions_{t}}\ , \ IV_{shares_{j,t}} = \sum_{s} \omega_{j,s,t} Ideo_{s,t}\ ,$$

I do not include the whole period in our analysis, as the surge in ideological contribu-

[11]These shares are computed using Eckert et al. (2020)'s dataset.

tions starts in the early 2000s. Instead, I focus on the period 2004-2020, which is the period where I observe the surge in ideological contributions.

### Two Stage Least Squares Results

I proceed with a two-stage least squares (2SLS) estimation of the baseline regression model, using the share of ideologically motivated contributions that each industry is exposed to as an instrument for the share of business-related contributions that each industry makes. The first-stage equation for the two-stage least squares estimation is as follows:

$$\log(C)_{j,t} = \alpha_j + \nu_0 + \nu_1 \mathrm{IV}_{shares_{j,t}} + \nu_2 \Gamma_{j,t} + \epsilon_{j,t} \tag{2.12}$$

where $C$ is the total amount of contributions coming from industry $j$ at time $t$, $\alpha_j$ are industry fixed effects and $\Gamma_{j,t}$ are the same control variables used in the baseline regression. I use the predicted values from the first-stage regression to compute a predicted value for the share of contributions that each industry makes, $\widehat{CShare}$[12]. Results are presented in Table 2.5 for the baseline regression. Table 2.6 includes considers import penetration from China.

Table 2.5 showcases the robustness of our model. The first-stage regression establishes a positive and statistically significant correlation between industry exposure to the ideological surge in contributions ($\mathrm{IV}_{shares}$) and the log of total contributions ($C$), with an F-statistic strongly supporting the relevance of our instrument. The second stage, the predicted share of total campaign contributions ($\widehat{CShare}$) exhibits a positive and statistically significant correlation with Total Employment Shares (TES), albeit with a lower magnitude than in the non-IV case. This finding, though weaker, aligns with our

[12]Back-transformation from the log of contributions is done following Duan (1983).

| | 1st Stage | 2nd Stage | | | |
|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) |
| | y = log ($C$) | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | |
| $\text{IV}_{shares}$ | 0.133*** (0.023) | | | | |
| $\widehat{CShare}$ | | 0.443* (0.254) | -0.03 (0.123) | 0.128 (0.17) | -0.572*** (0.18) |
| TFP | 0.002 (0.003) | -1.87e-04 (0.022) | -0.013 (0.016) | -0.018 (0.02) | 0.018 (0.037) |
| log (FSize) | 0.336 (0.357) | 11.989*** (2.259) | -9.531*** (1.471) | -15.095*** (1.922) | 3.106 (2.303) |
| VA | 6.42e-07*** (1.75e-07) | 2.05e-06** (8.80e-07) | -2.37e-06*** (4.82e-07) | -3.43e-06*** (5.44e-07) | 1.38e-06 (9.02e-07) |
| R-squared | 0.125 | 0.249 | 0.622 | 0.618 | 0.066 |
| Observations | 440 | 440 | 440 | 440 | 440 |
| Included Effects | Entity | Entity | Entity | Entity | Entity |
| F-stat | 13.57 | 31.53 | 156.70 | 153.98 | 6.73 |
| F-stat (rob) | 12.88 | 10.95 | 26.15 | 33.77 | 3.36 |

TSLS estimates of baseline regression.
First stage: log ($C$), the log of the total amount of contributions by industry $i$ during political cycle $t$. Second stage: Employment shares across the firm size distribution, regressed against the predicted share of total campaign contributions during a given political cycle, and controls.
Observations are at the 3-digit NAICS industry level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table 2.5** – TSLS estimates of baseline regression.

| | 1st Stage | 2nd Stage | | | |
|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) |
| | y = log $(C)$ | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | |
| $\text{IV}_{shares}$ | 0.154*** (0.027) | | | | |
| IPen CH | 0.038*** (0.007) | 0.066 (0.086) | 0.031 (0.021) | -0.077** (0.033) | 0.011 (0.066) |
| $\widehat{CShare}$ | | 0.418* (0.216) | -0.037 (0.102) | 0.112 (0.144) | -0.53*** (0.149) |
| IPen CH*$\widehat{CShare}$ | | -0.085 (0.055) | -0.021* (0.012) | 0.057** (0.024) | 0.029 (0.037) |
| TFP | -0.002 (0.003) | 0.001 (0.023) | -0.013 (0.017) | -0.017 (0.021) | 0.016 (0.038) |
| log (FSize) | 0.85*** (0.306) | 11.942*** (2.215) | -9.404*** (1.504) | -15.398*** (1.966) | 3.456 (2.344) |
| VA | 5.69e-07*** (1.44e-07) | 2.13e-06** (8.53e-07) | -2.40e-06*** (4.83e-07) | -3.33e-06*** (5.38e-07) | 1.21e-06 (8.96e-07) |
| R-squared | 0.198 | 0.255 | 0.625 | 0.625 | 0.067 |
| Observations | 440 | 440 | 440 | 440 | 440 |
| Included Effects | Entity | Entity | Entity | Entity | Entity |
| F-stat | 18.79 | 21.60 | 105.24 | 105.48 | 4.54 |
| F-stat (rob) | 15.28 | 7.59 | 18.26 | 23.68 | 2.85 |

TSLS estimates of baseline regression.
First stage: log $(C)$, the log of the total amount of contributions by industry $i$ during political cycle $t$. Second stage: Employment shares across the firm size distribution, regressed against the predicted share of total campaign contributions during a given political cycle, and controls, including IPen CH, import penetration from China, and its interaction with the predicted share of total campaign contributions.
Observations are at the 3-digit NAICS industry level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table 2.6** – TSLS estimates of baseline regression augmented with import penetration from China and its interaction with the predicted share of total campaign contributions.

hypothesis regarding the influence of contributions on employment distribution, particularly towards larger firms. A negative and statistically significant correlation with Medium-Sized Employment Shares (MES) reinforces the notion of a shift in employment away from mid-sized firms, which is consistent with a rent-seeking hypothesis and an increase in concentration. The coefficient for TFP remains non-significant for TES, underscoring the limited role of productivity in the full sample. However, log (FSize) shows a strong and statistically significant correlation with TES, BES20, and BES100, indicating its substantial impact on the employment shares across different firm sizes. VA maintains its significance, particularly in TES and BES20 regressions, highlighting the importance of industry economic output in shaping firm size distribution. Overall, the 2SLS results confirm the baseline findings, which addresses potential endogeneity issues like reverse causality.

When incorporating import penetration fom China into the analysis, I observe results akin to the non-IV case. Specifically, there is a positive and statistically significant effect of *CShare* on TES and a negative, statistically significant effect on MES, mirroring the baseline regression. However, the IV results, albeit weaker than the non-IV results, are expected due to the potential upward bias of the non-IV results from reverse causality. While the interaction terms are not statistically significant, the direction of the coefficients aligns with expectations. The interaction term between *CShare* and *IPen CH* for TES is negative, and for MES, it is positive. Notably, the interaction term for BES20 is statistically significant and negative, while the coefficient for BES100, also statistically significant, is positive. This pattern hints at a protective effect of contributions on small and medium-sized firms, consistent with the notion of contributions as a rent-seeking mechanism.

### 2.4.3 Robustness

**Baseline** Section 2.B.1 from the Appendix shows the results of using different specifications, where test as covariates of interest the natural log of industry i's total campaign contributions $\log(C)$, as well as the log of industry i's total indirect campaign contributions, $\log(IC)$.

**Evidence from TFP** Table A.12 in Appendix 2.B.1 presents the statistics for each subsample over the whole period, as well as for each decade. As a robustness check, I perform the same analysis using other criteria to select industries. Section 2.B.1 also presents the results of these analyses, where I discrimate industries based on whether their average yearly TFP growth over the periods 1989-2020,1989-1999, 2000-2009, and 2010-2020 is negative or positive. Among these subsample criteria, the one that yields the most promising results is the one based on the average yearly TFP growth over the period 2010-2020, which is the period where I observe the surge in ideological contributions.

## 2.5. Conclusions

This paper explores the relationship between political contributions and industry concentration in the United States over the period 1990-2018. It provide evidence that rent-seeking behavior is at least partially responsible for the documented increase in concentration in the United States economy over the last decades. Our contribution lies at the intersection of the literature on the rise of concentration in the United States and the literature on the political economy of lobbying. From the former, I borrow the idea that the rise of concentration in the United States is driven by a combination of factors, including the rise of "superstar" firms, as well as the rise of "barriers to entry" that favor SIGs within an industry. From the latter, I borrow the idea that political contributions are a form of rent-seeking behavior, and that they have an economic impact through their effect on the political process. Further research is needed to better understand and quantify the economic impact of political contributions, particularly the market power implications of rent-seeking behavior and its welfare consequences.

# Appendix 2.A Data

## 2.A.1 Business Dynamics Statistics

### Firm Size Categories

The BDS dataset provides information on the number of firms and employment by firm size category for each industry. They provide the following firm size categories: *a*) 1 to 4, *b*) 5 to 9, *c*) 10 to 19, *d*) 20 to 99, *e*) 100 to 499, *f*) 500 to 999, *g*) 1000 to 2499, *h*) 2500 to 4999, *i*) 5000 to 9999 and *j*) 10000+. Below is an example of the dataset for the year 1992 and industry 331 (Primary Metal Manufacturing). The third column shows the firm size category, the fourth column shows the number of firms in that category, and the fifth column shows the number of employees in that category.

| year | vcnaics | fsize | firms | emp |
|---|---|---|---|---|
| 1992 | 331 | a | 828 | 2174 |
| 1992 | 331 | b | 537 | 3926 |
| 1992 | 331 | c | 625 | 9019 |
| 1992 | 331 | d | 1204 | 51708 |
| 1992 | 331 | e | 564 | 93844 |
| 1992 | 331 | f | 106 | 40869 |
| 1992 | 331 | g | 127 | 64072 |
| 1992 | 331 | h | 81 | 69919 |
| 1992 | 331 | i | 56 | 72993 |
| 1992 | 331 | j | 73 | 160273 |

Example of the firm size categories for the year 1992 and industry 331 (Primary Metal Manufacturing).

**Table A.1** – Firm Size Categories.

### Descriptive statistics

The following table shows the number of firms, employment, and number of establishments for each industry.

| | Total Industry | Total Sectors | TES | | (\%) of Top Firms | | BES | | (\%) of Bottom Firms | | FSize | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | | | Mean | Std | Mean | Std | Mean | Std | Mean | Std | Mean | Std |
| 1992 | 84 | 19 | 35.41 | 22.49 | 1.98 | 4.05 | 20.6 | 16.45 | 76.58 | 17.47 | 6.29e+03 | 1.35e+04 |
| 1993 | 84 | 19 | 35.98 | 22.29 | 1.95 | 3.86 | 20.47 | 16.27 | 76.91 | 17.2 | 6.24e+03 | 1.37e+04 |
| 1994 | 84 | 19 | 36.24 | 21.83 | 1.99 | 4.08 | 20.12 | 15.97 | 76.97 | 17.2 | 6.21e+03 | 1.38e+04 |
| 1995 | 84 | 19 | 36.56 | 21.95 | 1.97 | 3.98 | 19.76 | 15.66 | 77.02 | 17.13 | 6.26e+03 | 1.40e+04 |
| 1996 | 84 | 19 | 37.48 | 21.95 | 1.96 | 3.95 | 19.54 | 15.36 | 77.22 | 17.23 | 6.29e+03 | 1.48e+04 |
| 1997 | 84 | 19 | 36.84 | 21.76 | 1.96 | 4.25 | 19.18 | 14.94 | 77.25 | 17.51 | 6.49e+03 | 1.56e+04 |
| 1998 | 84 | 19 | 37.66 | 21.78 | 1.92 | 4.03 | 18.82 | 14.74 | 77.21 | 17.31 | 6.25e+03 | 1.33e+04 |
| 1999 | 84 | 19 | 38.41 | 21.71 | 1.89 | 4.07 | 18.4 | 14.4 | 77.24 | 17.12 | 6.26e+03 | 1.36e+04 |
| 2000 | 84 | 19 | 38.94 | 21.51 | 1.88 | 4.08 | 18.05 | 14.03 | 77.24 | 16.97 | 6.37e+03 | 1.37e+04 |
| 2001 | 84 | 19 | 39.11 | 21.69 | 1.79 | 3.82 | 17.94 | 13.92 | 77.31 | 16.8 | 6.36e+03 | 1.41e+04 |
| 2002 | 84 | 19 | 39.33 | 21.62 | 1.8 | 3.89 | 18.45 | 14.21 | 77.43 | 16.98 | 6.26e+03 | 1.47e+04 |
| 2003 | 84 | 19 | 38.55 | 21.69 | 1.79 | 3.92 | 18.52 | 14.0 | 77.78 | 16.74 | 6.14e+03 | 1.45e+04 |
| 2004 | 84 | 19 | 37.94 | 22.12 | 1.65 | 3.39 | 18.69 | 14.19 | 77.99 | 16.32 | 6.06e+03 | 1.43e+04 |
| 2005 | 84 | 19 | 38.36 | 21.52 | 1.64 | 3.36 | 18.27 | 13.75 | 78.09 | 16.35 | 6.06e+03 | 1.41e+04 |
| 2006 | 84 | 19 | 38.67 | 21.59 | 1.7 | 3.54 | 18.12 | 13.8 | 77.96 | 16.96 | 6.30e+03 | 1.56e+04 |
| 2007 | 84 | 19 | 39.2 | 21.68 | 1.71 | 3.75 | 17.63 | 13.68 | 77.93 | 17.2 | 6.51e+03 | 1.67e+04 |
| 2008 | 84 | 19 | 39.32 | 21.47 | 1.65 | 3.41 | 17.52 | 13.34 | 78.05 | 16.83 | 6.50e+03 | 1.65e+04 |
| 2009 | 84 | 19 | 39.76 | 21.1 | 1.61 | 3.39 | 17.69 | 13.42 | 78.44 | 16.62 | 6.35e+03 | 1.63e+04 |
| 2010 | 84 | 19 | 39.74 | 21.59 | 1.62 | 3.67 | 17.97 | 13.52 | 78.85 | 16.92 | 6.38e+03 | 1.72e+04 |
| 2011 | 84 | 19 | 39.58 | 21.48 | 1.65 | 3.96 | 17.76 | 13.45 | 78.82 | 17.23 | 6.55e+03 | 1.77e+04 |
| 2012 | 84 | 19 | 39.64 | 21.4 | 1.69 | 4.09 | 17.49 | 13.41 | 78.58 | 17.51 | 6.77e+03 | 1.87e+04 |
| 2013 | 84 | 19 | 39.73 | 21.18 | 1.68 | 3.84 | 17.34 | 13.22 | 78.52 | 17.07 | 6.71e+03 | 1.82e+04 |
| 2014 | 84 | 19 | 39.76 | 21.0 | 1.7 | 3.88 | 17.11 | 13.0 | 78.35 | 17.13 | 6.81e+03 | 1.85e+04 |
| 2015 | 84 | 19 | 40.01 | 20.77 | 1.66 | 3.57 | 16.78 | 12.79 | 78.19 | 17.31 | 6.99e+03 | 1.96e+04 |
| 2016 | 84 | 19 | 39.78 | 21.51 | 1.65 | 3.48 | 16.97 | 13.05 | 78.09 | 17.41 | 7.12e+03 | 2.05e+04 |
| 2017 | 84 | 19 | 40.37 | 21.17 | 1.69 | 3.54 | 16.77 | 13.08 | 78.04 | 17.4 | 7.38e+03 | 2.21e+04 |
| 2018 | 84 | 19 | 40.27 | 21.92 | 1.63 | 3.41 | 16.57 | 12.83 | 78.13 | 17.24 | 7.37e+03 | 2.16e+04 |
| 2019 | 84 | 19 | 40.26 | 21.74 | 1.64 | 3.4 | 16.46 | 12.82 | 78.03 | 17.33 | 7.55e+03 | 2.22e+04 |
| 2020 | 84 | 19 | 40.9 | 21.39 | 1.68 | 3.57 | 16.15 | 12.57 | 77.91 | 17.24 | 7.66e+03 | 2.27e+04 |

**Table A.2** – Descriptive Statistics for BDS-derived Variables, 1990-2020

## 2.A.2 OpenSecrets Bulk Data Campaign Finance Tables

| | Contributions | | Business Contributions - Share of Total (%) | | Indirect Contributions - Share of Industry Total (%) | |
|---|---|---|---|---|---|---|
| Cycle | Mean | Std | Mean | Std | Mean | Std |
| 1990 | 2.86e+06 | 5.56e+06 | 0.81 | 1.57 | 0.97 | 5.88 |
| 1992 | 5.48e+06 | 1.14e+07 | 0.82 | 1.71 | 14.19 | 10.85 |
| 1994 | 5.06e+06 | 1.03e+07 | 0.85 | 1.73 | 14.57 | 11.49 |
| 1996 | 8.09e+06 | 1.64e+07 | 0.85 | 1.73 | 23.79 | 14.75 |
| 1998 | 6.80e+06 | 1.33e+07 | 0.86 | 1.68 | 22.89 | 15.69 |
| 2000 | 1.29e+07 | 2.65e+07 | 0.89 | 1.82 | 29.11 | 17.23 |
| 2002 | 1.05e+07 | 2.12e+07 | 0.86 | 1.73 | 29.3 | 19.42 |
| 2004 | 1.46e+07 | 3.63e+07 | 0.75 | 1.88 | 0.27 | 0.8 |
| 2006 | 1.16e+07 | 2.77e+07 | 0.75 | 1.8 | 0.64 | 1.52 |
| 2008 | 2.11e+07 | 5.31e+07 | 0.81 | 2.03 | 0.36 | 1.2 |
| 2010 | 1.34e+07 | 3.19e+07 | 0.72 | 1.71 | 0.8 | 2.14 |
| 2012 | 2.26e+07 | 5.15e+07 | 0.63 | 1.44 | 0.57 | 1.65 |
| 2014 | 1.43e+07 | 3.11e+07 | 0.64 | 1.4 | 0.93 | 3.29 |
| 2016 | 2.45e+07 | 5.45e+07 | 0.58 | 1.3 | 0.54 | 1.51 |
| 2018 | 1.97e+07 | 4.53e+07 | 0.58 | 1.34 | 0.86 | 2.62 |

**Table A.3** – Descriptive Statistics for Political Contributions, 1990-2018

| Cycle | Total Cycle Contributions | State-Traceable Contributions | State-Traceable Share of Total Contributions (%) |
|---|---|---|---|
| 1990 | 354.47 | 352.04 | 99.32 |
| 1992 | 669.66 | 635.24 | 94.86 |
| 1994 | 595.9 | 589.73 | 98.96 |
| 1996 | 949.72 | 918.98 | 96.76 |
| 1998 | 790.66 | 781.22 | 98.81 |
| 2000 | 1457.98 | 1393.6 | 95.58 |
| 2002 | 1222.47 | 1216.66 | 99.53 |
| 2004 | 1931.22 | 1652.84 | 85.59 |
| 2006 | 1538.16 | 1535.25 | 99.81 |
| 2008 | 2614.65 | 2365.41 | 90.47 |
| 2010 | 1864.41 | 1857.16 | 99.61 |
| 2012 | 3571.49 | 2901.51 | 81.24 |
| 2014 | 2225.91 | 2220.27 | 99.75 |
| 2016 | 4194.13 | 3515.44 | 83.82 |
| 2018 | 3372.96 | 3356.0 | 99.5 |

Total Contributions per Political Cycle, total State-Traceable Contributions per Cycle and total State-Traceable Contributions per Cycle as a share of Total Contributions.

**Table A.4** – Contribution Totals by Political Cycle.

## 2.A.3 Main Dataset

| | Total Industry | Total Sectors | TES | | BES20 | | BES100 | | MES | | FSize | | Value Added | | Industry Contributions | | (\%) of Campaign Contributions | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cycle | | | Mean | Std | Mean | Std | Mean | Std | Mean | Std | Mean | Std | Mean | Std | Mean | Std | Mean | Std |
| 1990 | 55 | 19 | 39.12 | 21.6 | 16.4 | 14.08 | 33.26 | 20.46 | 27.62 | 9.68 | 60.02 | 60.22 | 9.08e+04 | 1.13e+05 | 4.41e+06 | 6.64e+06 | 1.04 | 1.82 |
| 1992 | 55 | 19 | 39.41 | 21.53 | 16.45 | 14.04 | 33.0 | 20.35 | 27.6 | 9.55 | 60.01 | 61.52 | 1.92e+05 | 2.41e+05 | 8.41e+06 | 1.36e+07 | 1.07 | 2.0 |
| 1994 | 55 | 19 | 39.11 | 20.82 | 16.27 | 13.75 | 32.77 | 19.76 | 28.12 | 9.39 | 58.16 | 58.1 | 2.16e+05 | 2.73e+05 | 7.76e+06 | 1.23e+07 | 1.1 | 2.03 |
| 1996 | 55 | 19 | 40.14 | 20.51 | 15.9 | 13.32 | 32.09 | 19.34 | 27.76 | 9.17 | 57.32 | 55.54 | 2.42e+05 | 3.07e+05 | 1.25e+07 | 1.95e+07 | 1.11 | 2.02 |
| 1998 | 55 | 19 | 40.86 | 20.18 | 15.2 | 12.66 | 31.4 | 18.49 | 27.74 | 9.1 | 59.02 | 57.35 | 2.74e+05 | 3.46e+05 | 1.05e+07 | 1.58e+07 | 1.11 | 1.95 |
| 2000 | 55 | 19 | 41.55 | 20.22 | 14.68 | 12.14 | 30.58 | 17.95 | 27.88 | 9.25 | 59.81 | 57.67 | 3.11e+05 | 3.94e+05 | 1.99e+07 | 3.16e+07 | 1.15 | 2.12 |
| 2002 | 55 | 19 | 41.72 | 20.43 | 14.86 | 12.2 | 30.93 | 17.98 | 27.35 | 9.12 | 56.22 | 52.66 | 3.35e+05 | 4.39e+05 | 1.62e+07 | 2.52e+07 | 1.12 | 2.01 |
| 2004 | 55 | 19 | 40.77 | 20.14 | 14.94 | 11.93 | 31.12 | 17.83 | 28.11 | 9.16 | 54.17 | 48.92 | 3.67e+05 | 4.83e+05 | 2.27e+07 | 4.35e+07 | 1.0 | 2.22 |
| 2006 | 55 | 19 | 40.45 | 19.92 | 14.78 | 11.79 | 30.85 | 17.51 | 28.71 | 8.95 | 54.96 | 49.3 | 4.19e+05 | 5.47e+05 | 1.79e+07 | 3.32e+07 | 1.0 | 2.12 |
| 2008 | 55 | 19 | 40.87 | 19.77 | 14.23 | 11.32 | 29.98 | 17.08 | 29.15 | 8.96 | 55.68 | 50.92 | 4.55e+05 | 6.07e+05 | 3.26e+07 | 6.33e+07 | 1.09 | 2.4 |
| 2010 | 55 | 19 | 40.51 | 19.8 | 14.86 | 11.56 | 30.42 | 17.12 | 29.07 | 9.11 | 53.19 | 50.17 | 4.56e+05 | 6.19e+05 | 2.06e+07 | 3.79e+07 | 0.96 | 2.02 |
| 2012 | 55 | 19 | 40.17 | 19.71 | 14.57 | 11.49 | 30.2 | 17.25 | 29.63 | 9.27 | 56.04 | 53.92 | 4.94e+05 | 6.67e+05 | 3.49e+07 | 6.09e+07 | 0.85 | 1.7 |
| 2014 | 55 | 19 | 40.59 | 19.39 | 14.12 | 11.25 | 29.54 | 17.0 | 29.87 | 9.35 | 56.92 | 53.59 | 5.35e+05 | 7.18e+05 | 2.20e+07 | 3.68e+07 | 0.85 | 1.64 |
| 2016 | 55 | 19 | 40.95 | 19.49 | 13.83 | 11.07 | 29.03 | 16.85 | 30.02 | 9.51 | 57.61 | 53.92 | 5.78e+05 | 7.76e+05 | 3.80e+07 | 6.46e+07 | 0.78 | 1.53 |
| 2018 | 55 | 19 | 41.25 | 19.68 | 13.55 | 10.89 | 28.42 | 16.56 | 30.33 | 9.71 | 59.56 | 55.56 | 6.29e+05 | 8.38e+05 | 3.03e+07 | 5.35e+07 | 0.78 | 1.58 |
| 2020 | 55 | 19 | 41.72 | 19.48 | 13.07 | 10.56 | 27.73 | 16.21 | 30.56 | 9.7 | 61.41 | 58.31 | 6.65e+05 | 9.09e+05 | nan | nan | nan | nan |

**Table A.5** – Descriptive Statistics for the main dataset, 1990-2020.

# Appendix 2.B Additional Results

## 2.B.1 Industry Employment per Firm Size Category

### Baseline Regression with other Covariates

Table A.6 shows the results of a similar specification to the baseline, where instead of *CShare* we use as a covariate the natural log of total industry contributions.

| Regression | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | |
| log (C) | -0.546 (0.863) | 0.131 (0.122) | 0.23 (0.216) | 0.316 (0.704) |
| BCRA*log (C) | -0.034 (0.273) | -0.244* (0.146) | -0.179 (0.201) | 0.212 (0.274) |
| PostBCRA*log (C) | -0.287 (0.505) | -0.378 (0.249) | -0.211 (0.347) | 0.498 (0.456) |
| log (FSize) | 19.413*** (2.649) | -12.89*** (1.227) | -19.908*** (1.482) | 0.495 (2.599) |
| TFP | -0.022 (0.03) | 0.01 (0.017) | 0.018 (0.017) | 0.004 (0.025) |
| VA | 3.35e-06*** (1.10e-06) | -1.36e-06*** (4.38e-07) | -2.05e-06*** (7.44e-07) | -1.30e-06 (1.23e-06) |
| R-squared | 0.469 | 0.71 | 0.739 | 0.017 |
| Observations | 825 | 825 | 825 | 825 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against log (C), the natural log of industry *i*'s total campaign contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.6** – Baseline regression results with the log of total campaign contributions as the independent variable.

Table A.7 and A.8 show the results of a similar specification to the baseline, where instead of *CShare* we use the natural log of each industry's total amount of indirect contributions. Table A.7 does not control for *CShare*, Table A.8 does control for *CShare*.

| Regression | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | y = TES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | |
| log (IC) | 0.054 (0.048) | -0.036 (0.168) | 0.121*** (0.047) | 0.072 (0.063) | -0.035 (0.136) |
| BCRA*log (IC) | -0.115* (0.064) | -0.046 (0.158) | -0.105** (0.053) | -0.066 (0.066) | 0.113 (0.133) |
| PostBCRA*log (IC) | -0.123 (0.101) | -0.048 (0.206) | -0.113 (0.074) | -0.063 (0.098) | 0.111 (0.179) |
| BCRA | 1.057 (0.93) | | | | |
| PostBCRA | 0.101 (1.322) | | | | |
| log (FSize) | 19.329*** (2.409) | 19.491*** (2.626) | -12.729*** (1.31) | -19.817*** (1.545) | 0.326 (2.691) |
| TFP | -0.025 (0.028) | -0.026 (0.029) | 0.01 (0.017) | 0.018 (0.017) | 0.008 (0.025) |
| VA | 3.34e-06*** (7.27e-07) | 3.10e-06*** (8.57e-07) | -1.74e-06*** (3.88e-07) | -2.25e-06*** (6.44e-07) | -8.50e-07 (9.45e-07) |
| R-squared | 0.474 | 0.466 | 0.706 | 0.738 | 0.01 |
| Observations | 825 | 825 | 825 | 825 | 825 |
| Included Effects | Entity | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against log (IC), the natural log of industry *i*'s amount of indirect contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.7** – Baseline regression results with the log of total indirect contributions as the independent variable.

| Regression | (1) y = TES | (2) y = TES | (3) y = BES20 | (4) y = BES100 | (5) y = MES |
|---|---|---|---|---|---|
| Covariates | | | | | |
| log (IC) | 0.039 (0.048) | -0.073 (0.169) | 0.118*** (0.045) | 0.076 (0.062) | -0.003 (0.137) |
| BCRA*log (IC) | -0.122* (0.065) | -0.034 (0.16) | -0.104** (0.052) | -0.068 (0.066) | 0.102 (0.135) |
| PostBCRA*log (IC) | -0.098 (0.1) | -0.002 (0.206) | -0.109 (0.072) | -0.069 (0.097) | 0.07 (0.179) |
| BCRA | 1.083 (0.927) | | | | |
| PostBCRA | 0.03 (1.323) | | | | |
| CShare | 1.116** (0.542) | 1.071* (0.573) | 0.089 (0.183) | -0.135 (0.212) | -0.936* (0.53) |
| log (FSize) | 19.265*** (2.387) | 19.369*** (2.612) | -12.74*** (1.312) | -19.802*** (1.545) | 0.433 (2.688) |
| TFP | -0.026 (0.027) | -0.027 (0.028) | 0.009 (0.017) | 0.018 (0.017) | 0.009 (0.025) |
| VA | 3.67e-06*** (8.79e-07) | 3.35e-06*** (9.81e-07) | -1.72e-06*** (3.79e-07) | -2.28e-06*** (6.38e-07) | -1.07e-06 (1.12e-06) |
| R-squared | 0.484 | 0.475 | 0.707 | 0.738 | 0.027 |
| Observations | 825 | 825 | 825 | 825 | 825 |
| Included Effects | Entity | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against log (IC), the natural log of industry *i*'s amount of indirect contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
CShare included as a control variables.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.8** – Baseline regression results with the log of indirect contributions as the independent variable, with CShare included as a control variable.

**Firm Size Categories' Share of Firms** The following tables show the share of firms in each firm size category used as a dependent variable in the baseline specification. We find no clear pattern in the share of firms across firm size categories. Table A.9 shows the share of firms in each firm size category for the baseline specification. Table A.10 shows the same regression as in Table A.9 but using the IV for the share of firms in each firm size category. I fail to find a clear relationship between the share of firms in each firm size category and the share of contributions.

| Regression | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | y = TES FShare (%) | y = BES20 FShare (%) | y = BES100 FShare (%) | y = MES FShare (%) |
| Covariates | | | | |
| CShare | 0.04 (0.091) | 0.26 (0.22) | 0.241 (0.236) | -0.281 (0.207) |
| TFP | -0.005 (0.004) | 0.007 (0.011) | 0.013* (0.007) | -0.008 (0.006) |
| log (FSize) | 0.709 (0.506) | -10.817*** (2.158) | -4.733*** (0.958) | 4.024*** (0.706) |
| VA | 2.64e-07 (1.81e-07) | 2.49e-07 (4.31e-07) | 2.03e-07 (3.10e-07) | -4.67e-07 (2.96e-07) |
| R-squared | 0.045 | 0.5 | 0.271 | 0.304 |
| Observations | 825 | 825 | 825 | 825 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

FShare, the share of all firms in industry *i* that are in a given size group, regressed against CShare + controls.
* p < 0.1, ** p < 0.05, *** p < 0.01. Standard Errors in parentheses.

**Table A.9** – Main regression results with the FShare as the dependent variable.

| Regression | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | y = TES FShare (%) | y = BES20 FShare (%) | y = BES100 FShare (%) | y = MES FShare (%) |
| Covariates | | | | |
| $\widehat{CShare}$ | -0.051 (0.058) | 0.062 (0.137) | 0.056 (0.117) | -0.005 (0.072) |
| log (FSize) | 1.659 (1.349) | -11.488*** (2.096) | -7.21*** (2.198) | 5.551*** (1.223) |
| TFP | 0.001 (0.004) | 0.01 (0.01) | 0.002 (0.008) | -0.003 (0.007) |
| VA | 3.17e-08 (1.41e-07) | 6.54e-07 (6.15e-07) | 7.95e-07 (5.83e-07) | -8.26e-07 (5.04e-07) |
| R-squared | 0.052 | 0.374 | 0.237 | 0.281 |
| Observations | 440 | 440 | 440 | 440 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

TSLS regression results with FShare for each firm size group regressed against CShare and controls.
p < 0.1, ** p < 0.05, *** p < 0.01. Standard Errors in parentheses.

**Table A.10** – Main IV regression results with FShare as the dependent variable.

**Average Firm Size and Average Market Share** The following tables show average firm size and average, firm-level market share for each industry regressed on the share of contributions.

| Regression | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | y = log (FSize) | y = log (FSize) | y = MktShare | y = MktShare |
| Covariates | | | | |
| $\widehat{CShare}$ | 0.02 (0.017) | | 0.188 (0.599) | |
| CShare | | 0.01 (0.015) | | -2.402 (1.822) |
| TFP | 0.001 (0.001) | -0.001 (0.002) | 0.167 (0.171) | 0.156** (0.079) |
| VA | 5.31e-08 (6.59e-08) | 1.27e-07 (7.80e-08) | -1.12e-06 (4.98e-06) | -4.08e-06 (3.45e-06) |
| log (FSize) | | | 12.479** (5.324) | 6.14 (3.987) |
| R-squared | 0.042 | 0.059 | 0.029 | 0.03 |
| Observations | 440 | 825 | 440 | 825 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Regression results with two industry-level dependent variables, log of the average industry firm size ang average industry per-firm market share, regressed against CShare and controls.
First stage regressions done separately for each dependent variable so as to exclude log (FSize) from the controls for the first two columns.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.11** – IV regression results with the log(FSize) and MktShare as dependent variables.

### Evidence from TFP

**Additional Criteria for Industry Selection - Subsample Comparison.** A comparison of each subsample for all selection criteria is presented below in Table A.12. Statistics include the number of industries in each subsample, mean yearly TFP growth, total TFP growth, mean yearly TES growth, and total TES growth. These statistics are calculated over the period 1989-2020, 1989-1999, 2000-2009, and 2010-2020.

| | TFP-TES Correlation | | Mean Yearly TFP Growth (1989-2020) | | Mean Yearly TFP Growth (2010s) | | Mean Yearly TFP Growth (2000s) | | Mean Yearly TFP Growth (90s) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Positive Subsample | Negative Subsample | Positive Subsample | Negative Subsample | Positive Subsample | Negative Subsample | Positive Subsample | Negative Subsample | Positive Subsample | Negative Subsample |
| Number of Industries | 27.00 | 29.00 | 32.00 | 24.00 | 30.00 | 26.00 | 34.00 | 22.00 | 31.00 | 25.00 |
| Number of Manufacturing Industries | 6.00 | 12.00 | 12.00 | 6.00 | 12.00 | 6.00 | 14.00 | 4.00 | 11.00 | 7.00 |
| Mean Yearly TFP Growth (1989-2020 - %) | 0.44 | 0.19 | 0.87 | -0.43 | 0.55 | 0.03 | 0.63 | -0.19 | 0.76 | -0.26 |
| Mean Yearly TES Growth (1989-2020 - %) | 1.46 | 0.39 | 0.43 | 1.54 | 0.98 | 0.81 | 0.69 | 1.24 | 0.41 | 1.52 |
| Total TFP Growth (1989-2020 - %) | 18.81 | 18.30 | 40.29 | -10.46 | 28.84 | 6.66 | 32.53 | -3.07 | 38.90 | -6.70 |
| Total TES Growth (1989-2020 - %) | 36.19 | 9.93 | 13.11 | 35.24 | 15.68 | 30.57 | 21.45 | 24.36 | 11.77 | 36.01 |
| Mean Yearly TFP Growth (90s - %) | 0.64 | -0.01 | 1.03 | -0.67 | 0.23 | 0.39 | 0.44 | 0.09 | 1.37 | -1.02 |
| Mean Yearly TES Growth (90s - %) | 1.80 | 1.15 | 0.76 | 2.41 | 1.48 | 1.45 | 1.47 | 1.46 | 0.70 | 2.42 |
| Total TFP Growth (90s - %) | 7.07 | 1.32 | 11.93 | -6.36 | 3.66 | 4.60 | 5.77 | 1.50 | 15.37 | -9.89 |
| Total TES Growth (90s - %) | 15.67 | 11.35 | 5.74 | 23.69 | 12.62 | 14.38 | 13.16 | 13.86 | 5.05 | 23.83 |
| Mean Yearly TFP Growth (2000s - %) | 0.76 | 0.40 | 1.27 | -0.35 | 0.66 | 0.47 | 1.41 | -0.73 | 0.77 | 0.33 |
| Mean Yearly TES Growth (2000s - %) | 1.61 | -0.39 | 0.22 | 1.05 | 0.41 | 0.77 | 0.12 | 1.28 | 0.23 | 1.00 |
| Total TFP Growth (2000s - %) | 6.72 | 4.89 | 12.94 | -3.79 | 7.99 | 3.21 | 13.72 | -6.51 | 6.88 | 4.40 |
| Total TES Growth (2000s - %) | 5.63 | -4.25 | 2.05 | -1.54 | -3.14 | 4.73 | 0.81 | 0.05 | 1.80 | -1.09 |
| Mean Yearly TFP Growth (2010s - %) | -0.03 | 0.17 | 0.35 | -0.29 | 0.75 | -0.70 | 0.08 | 0.06 | 0.21 | -0.10 |
| Mean Yearly TES Growth (2010s - %) | 1.00 | 0.40 | 0.33 | 1.18 | 1.05 | 0.28 | 0.50 | 0.99 | 0.30 | 1.18 |
| Total TFP Growth (2010s - %) | -2.58 | 0.93 | 2.27 | -4.81 | 6.22 | -8.83 | 0.19 | -2.24 | 0.94 | -2.88 |
| Total TES Growth (2010s - %) | 5.18 | 4.95 | 4.78 | 5.44 | 6.33 | 3.61 | 6.90 | 2.23 | 5.05 | 5.09 |
| TFP-TES Correlation > 0 ( % of industries) | 100.00 | 0.00 | 56.25 | 37.50 | 46.67 | 50.00 | 52.94 | 40.91 | 54.84 | 40.00 |

**Table A.12** – Statistics for each subsample.

**Additional Criteria for Industry Selection- Regressions.** We carry out a similar analysis to that in Section 2.4.1 (Table 2.3) using different criteria to define industry subsamples. Tables A.13, A.14, A.15, and A.16 separate the sample into industries with negative and positive average yearly TFP growth over the periods 1989-2020, 1989-1999, 2000-2009, and 2010-2020, respectively. Then we performing the same analysis as in Table 2.3, performing the regression on each subsample.

| | Negative average TFP growth (yearly, 1989-2020) | | | | Positive average TFP growth (yearly,1989-2020) | | | |
|---|---|---|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | y = TES | y = BES20 | y = BES100 | y = MES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | | | | |
| CShare | 1.457 (1.033) | 0.262 (0.401) | 0.055 (0.412) | -1.512 (1.043) | 1.649 (1.125) | 0.095 (0.37) | -0.287 (0.463) | -1.362 (1.198) |
| BCRA*CShare | -0.195 (0.365) | -0.168 (0.189) | -0.152 (0.154) | 0.347 (0.442) | -0.2 (0.282) | 0.136 (0.116) | 0.219 (0.149) | -0.019 (0.291) |
| PostBCRA*CShare | 0.476 (0.557) | -0.365 (0.33) | -0.586* (0.329) | 0.11 (0.648) | -0.209 (0.374) | 0.185 (0.13) | 0.269** (0.136) | -0.06 (0.35) |
| lnFSize | 21.003*** (5.672) | -16.659*** (3.256) | -24.215*** (3.431) | 3.212 (4.99) | 18.838*** (2.983) | -11.323*** (1.568) | -18.511*** (1.782) | -0.328 (3.494) |
| TFP | -0.068 (0.049) | 0.049* (0.026) | 0.075*** (0.024) | -0.007 (0.049) | -0.028 (0.029) | -0.019** (0.009) | 0.008 (0.013) | 0.02 (0.032) |
| VA | 2.09e-06 (4.31e-06) | -2.86e-07 (2.29e-06) | 7.55e-07 (2.41e-06) | -2.85e-06 (5.39e-06) | 3.31e-06*** (1.20e-06) | -2.13e-06*** (3.85e-07) | -3.06e-06*** (6.42e-07) | -2.54e-07 (1.10e-06) |
| R-squared | 0.481 | 0.659 | 0.722 | 0.055 | 0.482 | 0.797 | 0.792 | 0.023 |
| Observations | 345 | 345 | 345 | 345 | 480 | 480 | 480 | 480 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
The sample is divided into two subsamples based on whether industry *i*'s experienced, on average, positive yearly TFP growth from 1989 to 2020.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.13** – Subsample regressions with negative and positive average TFP growth from 1989 to 2020.

| | Negative average TFP growth (yearly, 1989-1999) | | | | Positive average TFP growth (yearly,1989-1999) | | | |
|---|---|---|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | y = TES | y = BES20 | y = BES100 | y = MES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | | | | |
| CShare | 0.567 (0.966) | -0.068 (0.48) | -0.15 (0.519) | -0.417 (1.098) | 2.873** (1.354) | 0.501** (0.226) | 0.252 (0.384) | -3.126** (1.303) |
| BCRA*CShare | -0.01 (0.374) | -0.143 (0.183) | -0.141 (0.163) | 0.151 (0.446) | -0.547 (0.4) | 0.04 (0.097) | 0.12 (0.133) | 0.427 (0.414) |
| PostBCRA*CShare | 0.427 (0.56) | -0.526 (0.375) | -0.643* (0.354) | 0.216 (0.644) | -0.569 (0.373) | 0.139 (0.11) | 0.191 (0.147) | 0.377 (0.347) |
| lnFSize | 27.302*** (5.428) | -14.561*** (2.732) | -23.515*** (2.824) | -3.788 (4.725) | 16.551*** (2.668) | -11.481*** (1.57) | -18.096*** (1.79) | 1.545 (3.144) |
| TFP | -0.018 (0.056) | 0.036 (0.023) | 0.04* (0.024) | -0.022 (0.043) | -0.015 (0.023) | -0.02** (0.01) | -0.008 (0.013) | 0.023 (0.028) |
| VA | 8.37e-07 (4.42e-06) | 6.68e-07 (2.21e-06) | 1.60e-06 (2.34e-06) | -2.43e-06 (5.29e-06) | 3.48e-06*** (1.03e-06) | -2.41e-06*** (4.03e-07) | -3.35e-06*** (6.81e-07) | -1.34e-07 (9.00e-07) |
| R-squared | 0.522 | 0.625 | 0.721 | 0.045 | 0.478 | 0.806 | 0.774 | 0.088 |
| Observations | 360 | 360 | 360 | 360 | 465 | 465 | 465 | 465 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
The sample is divided into two subsamples based on whether industry *i*'s experienced, on average, positive yearly TFP growth from 1989 to 1999.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.14** – Subsample regressions with negative and positive average TFP growth from 1989 to 1999.

| | Negative average TFP growth (yearly, 2000-2009) | | | | Positive average TFP growth (yearly,2000-2009) | | | |
|---|---|---|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | y = TES | y = BES20 | y = BES100 | y = MES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | | | | |
| CShare | 1.327 (1.124) | -0.248 (0.457) | -0.387 (0.586) | -0.94 (0.811) | 1.131 (0.827) | 0.613 (0.569) | 0.321 (0.486) | -1.451 (0.909) |
| BCRA*CShare | -0.201 (0.326) | 0.07 (0.135) | 0.062 (0.159) | 0.139 (0.241) | -0.118 (0.21) | -0.145 (0.271) | -0.018 (0.194) | 0.135 (0.301) |
| PostBCRA*CShare | 0.336 (0.432) | -0.045 (0.171) | -0.202 (0.219) | -0.134 (0.32) | 0.054 (0.392) | -0.235 (0.429) | -0.152 (0.346) | 0.099 (0.342) |
| lnFSize | 24.191*** (5.985) | -12.707*** (1.673) | -22.869*** (3.378) | -1.322 (4.436) | 18.504*** (2.837) | -12.595*** (1.663) | -18.654*** (1.636) | 0.15 (3.28) |
| TFP | -0.061 (0.042) | 0.057*** (0.015) | 0.059*** (0.017) | 0.002 (0.031) | -0.021 (0.029) | -0.018 (0.012) | -0.014 (0.014) | 0.035 (0.035) |
| VA | 1.94e-06 (3.65e-06) | -2.43e-06 (1.57e-06) | -1.22e-06 (1.96e-06) | -7.25e-07 (2.86e-06) | 3.25e-06** (1.34e-06) | -1.64e-06*** (5.56e-07) | -2.71e-06*** (7.82e-07) | -5.45e-07 (1.55e-06) |
| R-squared | 0.48 | 0.72 | 0.692 | 0.021 | 0.489 | 0.727 | 0.775 | 0.036 |
| Observations | 315 | 315 | 315 | 315 | 510 | 510 | 510 | 510 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
The sample is divided into two subsamples based on whether industry *i*'s experienced, on average, positive yearly TFP growth from 2000 to 2009.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.15** – Subsample regressions with negative and positive average TFP growth from 2000 to 2009.

| | Negative average TFP growth (yearly, 2010-2020) | | | | Positive average TFP growth (yearly,2010-2020) | | | |
|---|---|---|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | y = TES | y = BES20 | y = BES100 | y = MES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | | | | |
| CShare | 1.432 (1.019) | 1.168** (0.512) | 0.749 (0.561) | -2.182** (0.888) | 1.353* (0.774) | -0.362 (0.371) | -0.668* (0.364) | -0.685 (0.708) |
| BCRA*CShare | -0.33 (0.246) | -0.26 (0.287) | -0.119 (0.211) | 0.448 (0.342) | -0.272 (0.169) | 0.049 (0.066) | 0.168** (0.084) | 0.104 (0.147) |
| PostBCRA*CShare | -0.222 (0.461) | -0.319 (0.431) | -0.432 (0.438) | 0.654 (0.434) | 0.103 (0.195) | -0.144 (0.095) | 0.011 (0.126) | -0.113 (0.171) |
| lnFSize | 15.771*** (4.973) | -14.402*** (2.245) | -21.717*** (2.991) | 5.945 (3.843) | 19.142*** (3.366) | -12.187*** (1.799) | -19.156*** (1.945) | 0.014 (4.05) |
| TFP | 0.074** (0.036) | -0.004 (0.013) | 0.013 (0.027) | -0.087*** (0.03) | -0.07* (0.037) | 0.018 (0.028) | 0.03 (0.024) | 0.04 (0.035) |
| VA | 3.81e-06 (4.31e-06) | -2.06e-06 (2.51e-06) | 3.65e-07 (2.84e-06) | -4.18e-06 (5.29e-06) | 3.41e-06*** (1.23e-06) | -1.81e-06*** (5.27e-07) | -3.03e-06*** (7.60e-07) | -3.81e-07 (1.13e-06) |
| R-squared | 0.314 | 0.634 | 0.616 | 0.147 | 0.589 | 0.767 | 0.809 | 0.035 |
| Observations | 390 | 390 | 390 | 390 | 435 | 435 | 435 | 435 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
The sample is divided into two subsamples based on whether industry *i*'s experienced, on average, positive yearly TFP growth from 2012 to 2020.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.16** – Subsample regressions with negative and positive average TFP growth from 2010 to 2020.

**Average Firm Size and TFP** The following table shows the level of correlation between average firm size and TFP among all industries.

| Industry | TFP x Firm Size Correlation | Industry | TFP x Firm Size Correlation |
|---|---|---|---|
| 113 | 0.129038 | 521 | -0.386600 |
| 211 | 0.887617 | 523 | -0.473344 |
| 212 | -0.557695 | 524 | 0.422591 |
| 213 | 0.926344 | 531 | 0.042605 |
| 220 | 0.338877 | 532 | -0.953775 |
| 230 | -0.502320 | 541 | -0.563019 |
| 311 | 0.741649 | 551 | 0.019952 |
| 313 | -0.895318 | 561 | 0.389899 |
| 315 | -0.902866 | 562 | -0.394465 |
| 321 | -0.600204 | 611 | -0.049634 |
| 322 | -0.229102 | 621 | 0.123213 |
| 323 | -0.499184 | 622 | -0.436923 |
| 324 | -0.428092 | 624 | -0.793166 |
| 325 | 0.627717 | 711 | 0.600229 |
| 326 | 0.498230 | 713 | -0.778681 |
| 327 | 0.426756 | 721 | 0.126216 |
| 331 | -0.615394 | 722 | 0.579104 |
| 332 | -0.163531 | 811 | -0.454685 |
| 333 | -0.038006 | 423 | 0.705334 |
| 334 | -0.886790 | 442 | 0.833492 |
| 335 | -0.826325 | 481 | -0.368341 |
| 336 | -0.604006 | 483 | 0.062233 |
| 337 | 0.255693 | 484 | 0.374793 |
| 339 | -0.576780 | 485 | 0.693520 |
| 486 | 0.218537 | 511 | 0.730666 |
| 487 | -0.379575 | 512 | 0.430041 |
| 493 | 0.716624 | 513 | 0.262250 |
| | | 514 | -0.306391 |

Correlation between TFP average Firm Size among all industries for the period 1989-2020.

**Table A.17** – Correlation between TFP average Firm Size across all industries.

## Penetration of Chinese Imports

The literature has shown that Chinese import penetration is associated with higher productivity. This result holds both for developed economies, including the United States, and for underdeveloped economies, such as those in Sub-Saharan Africa (Christian Darko and Vanino, 2021; Lind, 2022; Yahmed and Dougherty, 2017). Table A.18 shows the results of performing the same regression as in Section 2.4.1, Table 2.4, without TFP as a control variable.

The following table shows the level of correlation between Chinese import penetration and TFP among manufacturing industries.

| | Manufacturing Subsample | | | | Full Sample | | | |
|---|---|---|---|---|---|---|---|---|
| Regression | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | y = TES | y = BES20 | y = BES100 | y = MES | y = TES | y = BES20 | y = BES100 | y = MES |
| Covariates | | | | | | | | |
| CShare | 1.616 (1.016) | 0.994*** (0.244) | 0.776 (0.582) | -2.393** (1.108) | 0.987* (0.555) | 0.18 (0.179) | -0.079 (0.198) | -0.908* (0.54) |
| IPenCH*CShare | -0.105* (0.055) | -0.105*** (0.014) | -0.047** (0.021) | 0.152*** (0.045) | -0.109** (0.054) | -0.066*** (0.016) | -0.004 (0.013) | 0.112** (0.045) |
| IPen CH | 0.198*** (0.051) | 0.074*** (0.013) | 0.019 (0.025) | -0.217*** (0.041) | 0.111* (0.061) | 0.031 (0.024) | 0.004 (0.028) | -0.115** (0.05) |
| log (FSize) | 24.973*** (3.6) | -9.661*** (0.821) | -18.929*** (1.623) | -6.044* (3.229) | 21.717*** (3.019) | -12.604*** (1.759) | -19.941*** (2.134) | -1.776 (2.813) |
| VA | -2.62e-06 (1.07e-05) | 2.55e-06* (1.40e-06) | 5.03e-06** (2.29e-06) | -2.42e-06 (1.01e-05) | 3.35e-06*** (9.74e-07) | -1.88e-06*** (4.75e-07) | -2.42e-06*** (6.27e-07) | -9.33e-07 (1.13e-06) |
| R-squared | 0.541 | 0.915 | 0.867 | 0.354 | 0.478 | 0.706 | 0.733 | 0.047 |
| Observations | 270 | 270 | 270 | 270 | 825 | 825 | 825 | 825 |
| Included Effects | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time | Entity, Time |

Employment shares across the firm size distribution regressed against CShare, industry *i*'s share of total campaign contributions during a given political cycle, IPen CH, the level of import penetration from China, and their interaction.
Observations are at the 3-digit NAICS industry level. Dummies for the BCRA and Post-BCRA periods.
The sample is divided into two subsamples, the manufacturing subsample and the full sample.
TFP is not included in the regression as a control variable.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors in parentheses.

**Table A.18** – Manufacturing and full sample regressions without TFP as a control variable.

| Industry | TFP x IPen CH correlation |
|---|---|
| 311 | -0.686139 |
| 313 | 0.675665 |
| 315 | 0.859136 |
| 321 | 0.621438 |
| 322 | 0.160287 |
| 323 | 0.976220 |
| 324 | 0.281854 |
| 325 | -0.878398 |
| 326 | 0.779729 |
| 327 | 0.448482 |
| 331 | 0.586894 |
| 332 | -0.183253 |
| 333 | 0.368371 |
| 334 | 0.972545 |
| 335 | 0.758684 |
| 336 | 0.931098 |
| 337 | -0.088029 |
| 339 | 0.941974 |

Correlation between TFP average Firm Size among all industries for the period 1989-2020.

**Table A.19** – Correlation between TFP average Firm Size among Manufacturing Industries.

## 2.B.2 Instrument Validity

**Balance Test of Shift Share Weights.** In order to assess the validity of the instrument, we perform a balance test of the shift-share weights. The balance test is performed by regressing the shift-share weights on the control variables.

| Variable | Coefficient | P-value | R-squared | Std. Error |
|---|---|---|---|---|
| TFP | -0.838021 | 0.465262 | -0.007148 | 2.998852 |
| VA | 27708.92538 | 0.365918 | 0.020473 | 41187.544088 |
| log (FSize) | -0.004039 | 0.404261 | 0.000491 | 0.031753 |

Test of Instrument's weights' correlation on Industry Controls-level controls - Average Across States. The table shows the average, across states, of the coefficients, p-values, R-squared, and standard errors of regressing the shift-share weights on the control variables. All three are insignificant at the 5% level and have almost zero explanatory power.

**Table A.20** – Balance Test of Shift Share Weights.

# Chapter 3

# Unleashing Potential: Foreign Workers and Direct Exports

## 3.1. Introduction

This article investigates whether foreign workers influence firms' likelihood to engage in direct or indirect exports. While the majority of exporting firms manage to internalise fixed export costs and engage in direct exports, others rely on trade intermediaries to gain access to foreign markets. Indirect trade constitutes a small – yet not negligible – proportion of trading activities, accounting for approximately 10 and 20 per cent of total exports in developed economies (Akerman, 2018; Bernard et al., 2015; Crozet et al., 2013). However, it is more important for emerging economies like China (22%) and Turkey (17%) (Ahn et al., 2011; Abel-Koch, 2013).

Trade intermediaries enable manufacturers to alleviate informational barriers that prevent them from exporting directly. They help manage risks and facilitate matching between buyers and sellers (Spulber, 1996; Blum et al., 2018). Indirect exporters are often small firms unable to cover the fixed costs of setting up their own foreign distribution network. Additionally, such exporters include firms engaged in developing new products and producing low-quality goods (Abel-Koch, 2013). Empirical research on trade intermediation also indicates that this export mode is used by small, less productive firms to reach export markers, as well as by firms in general to serve markets that are both small and difficult to reach(Ahn et al., 2011; Akerman, 2018; Bernard et al., 2015; Crozet et al., 2013).

Similar to trade intermediaries, foreign workers, in particular highly-skilled individuals, assist firms in overcoming informational barriers and reducing risks associated with exporting. While the literature has documented a positive impact of unskilled foreign workers on firms' productivity, which in turn has an indirect effect on their export performance, this effect is related to a productivity channel, and hence is not directly related to the fixed costs of exporting, the focus of this paper (Marchal and Nedoncelle, 2019). By comparison, highly-skilled foreign workers possess knowledge about their country of origin and have access to international business networks that foster export activity (Hanson, 2010; Hatzigeorgiou and Lodefalk, 2021; Parsons and Winters, 2014). This study explores whether foreign workers help firms export indirectly and/or directly. Do they enable less productive firms to access foreign markets through trade intermediaries? Do they help firms internalise the export process and export directly?

To investigate these questions, we build a heterogeneous firm model that integrates an intermediary sector, similar to Crozet et al., 2013, and foreign workers. Firms exhibit heterogeneity in both their productivity levels and the proportion of foreign workers they employ. They can export directly, indirectly, or not at all. If they export directly, they encounter destination-specific per unit and fixed entry costs. If they export indirectly, part of their output is sold to an intermediary, which subsequently handles the exporting process. In this scenario, firms face a reduced destination-specific fixed entry cost. A distinctive feature of the model is its ability to capture the role the foreign workers play in firms' choice of export mode. Building upon the documented effect of foreign workers on firm export performance (Hatzigeorgiou and Lodefalk, 2021), we hypothesise that they contribute to reducing the direct fixed export costs faced by their employing firm. However, the literature is silent on their impact on the indirect fixed export costs: they may have a negative impact on these, or no impact at all. We test both hypotheses in this paper.

We find that among firms with identical proportions of foreign workers, the most productive ones export directly, the medium productive ones export indirectly, the less productive ones do not export at all. We then analyse how firms' export decisions respond to changes in their employment of foreign workers.

Our results highlight that it is the most productive firms that are the most likely to benefit from foreign workers. They indicate that, even when foreign workers decrease fixed costs for both direct and indirect exports at the same rate, under the assumption that firm productivity follows a Pareto distribution, a standard assumption in the trade literature, the proportion of firms engaged in direct exports among all exporters increases in the share of foreign workers. Our model also predicts that indirect exporters and non exporting firms benefit as well, albeit to a lesser degree, since the share of firms engaging in indirect exports, and hence the overall share of firms engaged in trade, increases in the share of foreign workers.

We test the predictions of our model using the 2010 UNIDO Viet Nam Industry Investor Survey. The economic development witnessed by Viet Nam until 2010 was driven by trade expansion and inward foreign direct investment, which followed the 1986 'Doi Moi' (Renovation) economic reforms, as well as the country's accession to the World Trade Organization in 2007 (UNIDO, 2012). Our sample contains 1,152 large firms located in the principal nine provinces of Viet Nam and operating in the three main economic sectors (manufacturing, construction and utilities sectors). Among these firms, 29.8 per cent do not export, 4.0 per cent export indirectly, 59.4 per cent export directly, and 6.8 per cent use both export modes. In order to address potential endogeneity concerns, we employ an identification strategy that exploits the variation in the proportion of *unskilled* foreign workers across industries and provinces, in order to instrument for the proportion of *skilled* foreign workers. To suplement this identification strategy, we also use the doubly robust estimator of Lunceford and Davidian, 2004 to implement a propensity score matching estimator, which allows us to control for the potential endogeneity of the proportion of skilled foreign workers without relying on the share of unskilled foreign workers as an instrument.

We find supporting evidence that skilled foreign workers significantly influence firms' choice of export mode. Moreover, this pro-trade effect is particularly pronounced among larger firms that engage in direct exports.

Our study makes a contribution to the existing literature on the pro-trade effect of foreign workers, taking into account direct as well as indirect exports. First, this body of research shows that skilled and educated foreign workers effectively reduce trade costs for their employing firms. These workers play a crucial role in lowering transaction costs associated with linguistic, cultural, and institutional distances. For instance, a study by G. Ottaviano et al., 2018, using data on service firms in the U.K., shows that an increase in the supply of foreign workers promotes direct bilateral exports, particularly for language-intensive and culture-specific services. Similarly, Andrews et al., 2017 for Germany and Hiller, 2013 for Denmark show that foreign workers assist firms in reducing trade costs and facilitate direct export sales thanks to their destination-specific knowledge. Second, foreign workers also foster trade by improving firms' integration in the global value chain via their business networks and expertise in input quality (Bastos and Silva, 2012; Hatzigeorgiou and Lodefalk, 2016; Egger et al., 2019; Ariu, 2020). Third, foreign workers exert a significant impact on the performance of firms by enhancing productivity. These productivity gains arise from the imperfect substitution between foreign and native workers, resulting in a more efficient allocation of tasks within and across firms (Foged and Peri, 2016; G. Ottaviano et al., 2013; Peri and Sparber, 2009). Furthermore, these gains can be attributed to the adoption of novel and potentially more efficient technologies, and of innovation facilitated by an expanded knowledge base (Bitzer et al., 2021; Kerr and Lincoln, 2010; Lewis, 2011) and the presence of knowledge externalities (Mitaritonna et al., 2017; G. Ottaviano et al., 2018).

Our study is of particular interest to this strand of literature, as it examines the influence of skilled foreign workers on indirect and direct exports separately. We present a theoretically founded analysis that focuses on the influence of foreign workers on firms' export modes by investigating their impact on the fixed costs associated with exporting. These costs include the costs of establishing a foreign distribution network, finding buyers, and making sure that the goods are compliant with foreign regulations, among others, and usually require upfront investments in order to be covered but without varying much with the volume of exports (Castro et al., 2014; Melitz, 2003a). Evidence shows that foreign workers help firms access foreign markets by several channels, including reducing the fixed costs of exporting by providing information about foreign markets, with the effect being driven mostly by highly skilled foreign workers (Hatzigeorgiou and Lodefalk, 2021; Marchal and Nedoncelle, 2019).

More broadly, our study provides contributes as well to the literature on first order and second order selection effects among heterogeneous firms, where firms are confronted between serving or not serving a particular market, a first order selection effect, and, conditional on serving it, how to do so, a second order selection effect(Mrázová and Neary, 2018).

Finally, our article makes a contribution to the existing literature on the link between economic development and trade liberalisation in emerging countries such as south-east Asian and Latin American economies (Wacziarg and Welch, 2008; Winters et al., 2004; Bas and Ledezma, 2020). Given the significant role of the export sector in the Vietnamese economy, our study investigates a specific determinant of firm-level export behaviour, which holds potential implications at the aggregate level for both growth and poverty alleviation.

## 3.2. The Data

### 3.2.1 Data and Descriptive Statistics

**The survey.** We use the 2010 Viet Nam Industry Investor Survey, carried out by UNIDO in 2009 and 2010 in collaboration with Vietnamese institutions (UNIDO, 2012).[1] It covers 1,493 formal firms across nine major provinces – Ba Ria-Vung Tau, Bac Ninh, Binh Duong, Dong Nai, Vinh Phuc, Da Nang, Ha Noi, Hai Phong and Ho Chi Minh City – and across three sectors of the economy – manufacturing, construction and utilities. This last sector includes the public and energy sectors. The sample consists of 57.2 per

[1] In this sample, 11.9 per cent of manufacturing exporters were surveyed in 2010, the rest of the sample was surveyed in 2009.

cent foreign firms, 32.9 per cent private Vietnamese firms and 9.9 per cent state-owned firms. Only firms with a capital stock higher than 225,000 USD and more than 50 employees were included in the survey. This implies that our sample focuses on the middle and upper tail of the firm size distribution.

The survey collected information on firms' and employees' characteristics, and on firms' export behaviour in 2008, 2009 and 2010. Respondent firms had to answer the following question on their export mode: "What percentage of this enterprise's total sales by value was: sold in Viet Nam, exported directly, exported indirectly?" We combine this question of the survey with information on total sales to build our dependent variables (the probability of the firm to export directly and indirectly, and the export performance of the firm). After harmonising the data, we obtain a sample of 1,152 firms for which the export mode is known (77.3 per cent of the initial sample)[2]. Summary statistics for this sample of firms are provided in Appendix, Tables A.1 to A.3.

**Exporting firms.** About 70 per cent of firms report some export activity. Exporting firms are larger than non-exporting firms: they declare larger sales and are more likely to be multinational firms or to hold foreign capital; in addition, they employ a higher share of (skilled) foreign workers, which is in line with findings of the literature on the trade-migration nexus (Hatzigeorgiou and Lodefalk, 2021).

Exporting firms are heterogeneous in various dimensions. The distributions of export and domestic sales are shown in Figure 3.1. The graph on the left shows that about 30 per cent of firms do not export and about 30 per cent of them sell all their production abroad. This implies that the remaining firms export *and* serve their domestic market. Among these firms, the shares of domestic sales vary greatly, as shown by the graph on the right. Exporting firms are also heterogeneous in their export modes. 5.70 per cent of them export indirectly, 84.65 per cent export directly, and 9.65 per cent export using both export modes. On average, the value of direct and indirect exports respectively

[2] Among these firms, some firms answered that they export, but did not specify their export mode

represent 45.1 and 1.5 per cent of total sales; and indirect exports account for 3.16 per cent of total exports. Figure 3.2 depicts the statistical relationship between the size of the exporters (measured as the (log) number of permanent full-time workers) and the share of indirect exports. This graph shows a large heterogeneity in export modes across firm size. In addition, Table A.3 in Appendix 3.A.3 shows that indirect exporters report significantly smaller sales, assets, and costs, and serve a smaller number of destinations than direct exporters. The UNIDO data are thus in line with existing literature on the characteristics of indirect exporters (Ahn et al., 2011; Crozet et al., 2013).

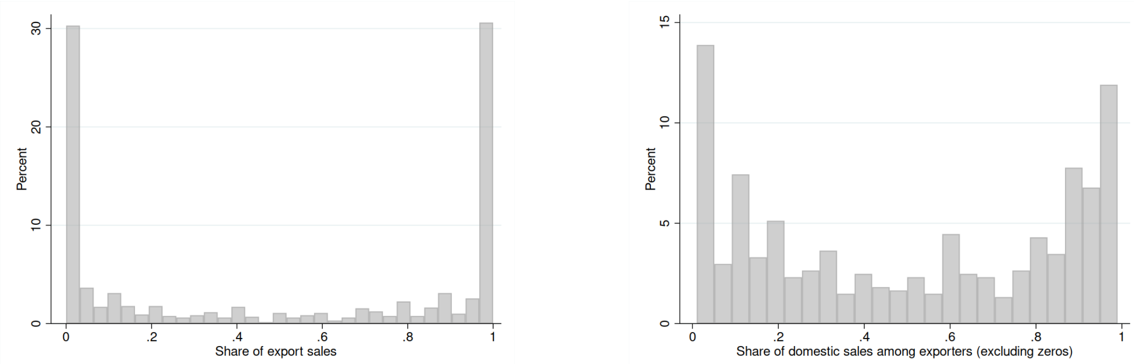



**Figure 3.1** – Share of Export and Domestic Sales

Note: The graph on the left shows the distribution of export sales as a percentage of total sales across all firms, including non-exporters (in the first bin). The graph on the right shows the distribution of domestic sales as a percentage of total sales across exporters that serve their domestic market (i.e. exporters not serving their domestic market are excluded).

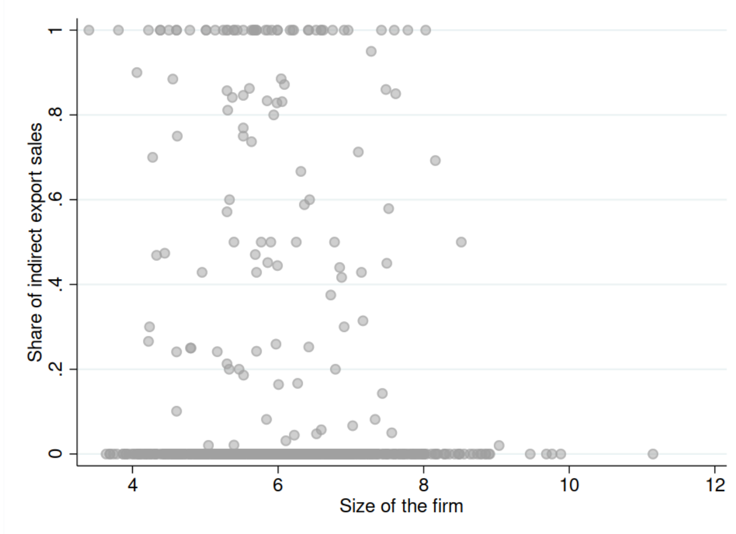



**Figure 3.2** – Share of Indirect Exports Across Exporting Firms' Size

Note: Statistical relationship between the size of the firm and the share of indirect export sales among exporting firms. The size of the firm is measured as the (log) number of permanent full-time workers employed by the firm in the previous year.

**Workforce composition.** The workforce composition of firms is disaggregated in four occupation groups: (i) technical and supervisory employees, (ii) managers, (iii) clerical and administrative employees, and (iv) production workers. Henceforth, we refer to the first two groups as *skilled* workers and to the last two groups as *unskilled* workers. For each occupation group, we know the numbers of native and foreign workers. Foreign workers account for 1.7 per cent of total employment. They account for about 15.7 and 0.4 per cent of skilled and unskilled workers respectively.

The Vietnamese labour market is characterised by a shortage of skilled workers, especially in the foreign invested sectors (Dang and Nguyen, 2021). Only 20 per cent of the demand for skilled labour could be addressed by the Vietnamese workforce in the last decade (Bodewig et al., 2014). Meanwhile, the World Development Indicators published by the World Bank indicate that immigrants accounted for less than 1 per cent of the population in 2010. Therefore, skilled foreign employees reported in the UNIDO survey are likely to be posted workers or expatriates. These workers are usually temporary migrant workers, sent to ensure tacit knowledge transfers and, in the case of multinational enterprises, to coordinate operations between the headquarter and the subsidiary (Kogut and Zander, 2003; Williams, 2007; Cho, 2018).

Figure 3.3 shows the shares of skilled foreign workers employed by non-exporters, indirect-only exporters, direct-only exporters, and firms using both export modes. For each export status, we find that firms are widely heterogeneous in their employment of skilled foreign workers, and that a large part of them do not employ any skilled foreign workers. Figure A.1 presents a similar graph for unskilled foreign workers, showing little heterogeneity across firms as most of them do not hire any unskilled foreign workers. In addition, we find that indirect exporters employ significantly more skilled foreign workers than direct exporters (see Table A.3). These descriptive statistics and the literature pointing to a stronger impact of skilled foreign workers relative to unskilled foreign workers on firms' performance lead us to focus the remainder of our analysis on skilled foreign workers.

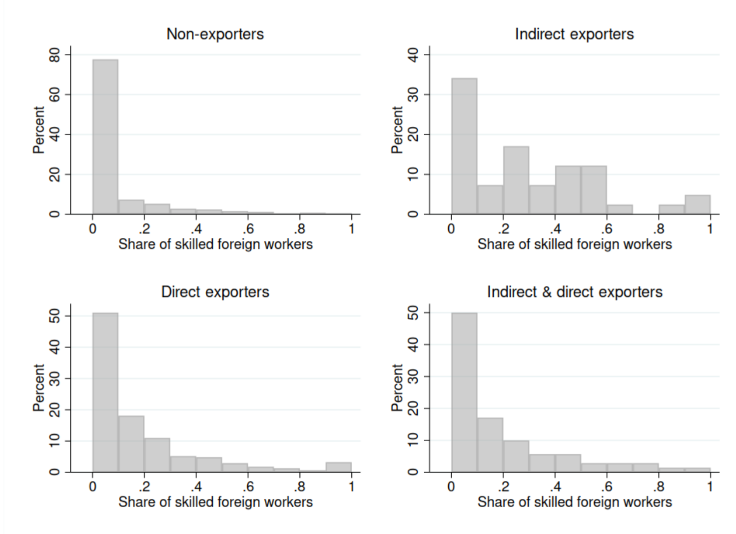



**Figure 3.3** – Share of Skilled Foreign Workers by Export Modes

Note: The four figures depict the distributions of the shares of skilled foreign worker observed across non-exporters, indirect-only exporters, direct-only exporters, and firms using both export modes.

### 3.2.2 Sample Representativeness

The 2010 Viet Nam Industry Investor Survey targets large and foreign firms (UNIDO, 2012). While the UNIDO data consists of 57.2 per cent foreign firms, the Viet Nam General Statistics Office estimates that the Vietnamese economy only consisted of 2.6 per cent foreign firms in 2010 (and 96.2 per cent domestic firms and 1.2 per cent state-owned firms). Nevertheless, the UNIDO data captures 31.6 per cent of Vietnamese exports realised by manufacturing firms in 2010 and reported by the Viet Nam General Statistics Office to the United Nations (Comtrade database).

The World Bank also conducted a Viet Nam Enterprise Survey in 2009. This survey contains 1,053 firms, among which 62.6 per cent do not export, 8.8 per cent export indirectly, 23.1 per cent export directly, and 5.5 per cent export both indirectly and directly. We find that firms larger than 50 employees with at least 10% of foreign ownership exhibit similar characteristics in both the 2010 UNIDO Viet Nam Industry Investor Survey and the 2009 World Bank Viet Nam Enterprise Survey (Table A.4).

## 3.3. Theoretical Framework

Our model builds upon Crozet et al., 2013, which consists of a heterogeneous firm model *à la* Melitz, 2003a that incorporates trade intermediaries. We modify it in order to capture the effect foreign workers have on firms' choice of export mode. We start by describing the demand and the production sides, before analysing the firm's choice of export mode.

### 3.3.1 Demand

The world is made of $J$ countries, trading with each other. The preferences of a representative consumer in country $j \in J$ can be represented by a CES utility function over a bundle of goods indexed by $k$:

$$U_j = \left[ \int_0^N (q_{kj})^{\frac{\sigma-1}{\sigma}} \mathrm{d}k \right]^{\frac{\sigma}{\sigma-1}} \tag{3.1}$$

where $q_{kj}$ is the demand for variety $k$ in country $j$, $N$ is the mass of available varieties and $\sigma > 1$ is the elasticity of substitution between varieties.

Total expenditure in country $j$, $E_j$, reads as follows:

$$E_j = \int_0^N p_{kj}^{\mathrm{CIF}} q_{kj} \mathrm{d}k \tag{3.2}$$

where $p_{kj}^{\mathrm{CIF}}$ is the trade-cost inclusive price (cost-insurance-freight or CIF price) of variety $k$ in country $j$.

Maximising utility subject to the budget constraint yields the demand curve for each variety $k$ available in country $j$:

$$q_{kj} = \left(p_{kj}^{\text{CIF}}\right)^{-\sigma} \frac{E_j}{{P_j}^{1-\sigma}} \tag{3.3}$$

where $P_j = \left[\int_0^N \left(p_{kj}^{\text{CIF}}\right)^{1-\sigma} \mathrm{d}k\right]^{\frac{1}{1-\sigma}}$ denotes country $j$'s CES price index.

### 3.3.2 Production Possibilities

A continuum of monopolistically competitive firms manufacture a distinct variety each (index $k$ thus represents a variety as well as a firm). Production requires a single factor, labour, supplied inelastically at aggregate level $L$. Firms in country $j$ face a fixed production cost $F_j$, with $j = h$ denoting production in the home country. They are heterogeneous in their productivity level measured by $1/c_k$, where $c_k$ is firm $k$'s marginal cost, and in the share of foreign workers they hire, denoted $\theta_k$. As is standard in the literature, we regard these two distributions as exogenous (Mrázová et al., 2021); we also assume that they are independent from each other.

Firm $k$ can produce for its domestic market, export directly or export indirectly through a trade intermediary. In each case, it chooses its optimal free on-board (FOB) price to maximise profits. From hereon we drop the subscript $k$ to identify firms, as their behaviour is completely characterized by the pair $c, \theta$.

When the firm serves its home market, denoted $h$, the FOB and CIF prices are equal. When exporting *directly* to a foreign country $j$, a firm in home country $h$ faces three distinct costs. First, it faces a fixed direct-export cost $F_j^d(\theta) > F_h$. In light of the documented effect of immigrants on export propensity (Hatzigeorgiou and Lodefalk, 2021), we assume that the fixed direct-export cost is decreasing in the share of foreign workers employed by the firm $\left(\mathrm{d}F_j^d(\theta)/\mathrm{d}\theta < 0\right)$[3]. This fixed direct-export cost is paid by the firm

[3] We assume an exogenous distribution of foreign workers across firms. In doing so, we can focus on the effect of foreign workers on firms' export behaviour through their effect on fixed export costs. We set

when entering a foreign market. It includes the search for potential clients, logistics and inventory, non-tariff trade barriers related to the regulatory and cultural context (Melitz, 2003a).

In addition, direct exporters face two variable exporting costs: a per-unit shipment cost, $T_j$, and an *ad-valorem* trade cost, $\tau_j > 1$, reflecting the increased marginal cost due to international freight, dealing with customs and adapting the product to a new regulatory and cultural environment. The CIF direct-export price can then be written as a function of the FOB price ($p_j$), such that $p_j^{CIF} = p_j \tau_j + T_j$.

When exporting *indirectly* to country $j$, a firm in home country $h$ sells part of its production to an intermediary, which then resales it abroad. The intermediary reduces the fixed cost of exporting since it must be easier for the firm to find foreign customers through the intermediary; additionally, as explained by Crozet et al., 2013, some aspects of the fixed cost of exporting are taken care of by the intermediary. Foreign workers hired by the firm may or may not have a negative impact on the fixed indirect-export cost, denoted $F_j^{ind}$. On the one hand, if the intermediary is in charge of all the exporting tasks, then foreign workers should not have any impact on the fixed exporting costs. In that case, the fixed indirect-export cost is assumed to be lower than the fixed direct-export cost for any share of foreign workers, which implies that $F_j^{ind} < F_j^d(1)$. On the other hand, if the firm still needs to manage some exporting tasks (such as choosing the countries it wants to export to, finding the appropriate intermediary or complying with the local regulatory framework before shipping the final product), then foreign workers may help alleviating these costs. Then, the fixed indirect-export cost, denoted $F_j^{ind}(\theta)$, is decreasing in the share of foreign workers hired by the firm, although nevertheless lower than the fixed direct-export cost, so that that $F_j^{ind}(\theta) < F_j^d(\theta)\ \forall \theta$.

aside other mechanisms through which foreign workers affect firms' export performance. In particular, we set aside the fact that foreign workers generate total factor productivity gains (Mitaritonna et al., 2017) thanks to their complementarity in tasks with native workers (Peri and Sparber, 2009).

**Domestic Production and Direct Exports**

Firms price their varieties for domestic sales and direct exports by solving two similar optimisation problems, detailed in Appendix 3.A.1. For domestic sales, profit maximisation yields the constant markup pricing rule, along with firm domestic output and profits:

$$p_h = \frac{\sigma}{\sigma - 1} c \tag{3.4}$$

$$q_h(p_h) = \frac{E_h}{{P_h}^{1-\sigma}} \left(\frac{\sigma}{\sigma - 1}\right)^{-\sigma} c^{-\sigma} \tag{3.5}$$

$$\pi_h = \frac{1}{\sigma - 1} \left(\frac{\sigma}{\sigma - 1}\right)^{-\sigma} \frac{E_h}{{P_h}^{1-\sigma}} c^{1-\sigma} - F_h. \tag{3.6}$$

Profit maximisation for direct exports to country $j \neq h$ yields optimal FOB and CIF prices, optimal direct-export output and profits:

$$p_j = \frac{\sigma}{\sigma - 1} \left(c + \frac{T_j}{\sigma \tau_j}\right) \tag{3.7}$$

$$p_j^{CIF} = \frac{\sigma}{\sigma - 1} \left(c\tau_j + T_j\right) \tag{3.8}$$

$$q_j\left(p_j^{CIF}\right) = \frac{E_j}{{P_j}^{1-\sigma}} \left(\frac{\sigma}{\sigma - 1}\right)^{-\sigma} \left(c\tau_j + T_j\right)^{-\sigma} \tag{3.9}$$

$$\pi_j^d = \frac{1}{\sigma - 1} \left(\frac{\sigma}{\sigma - 1}\right)^{-\sigma} \frac{E_j {\tau_j}^{-\sigma}}{{P_j}^{1-\sigma}} \left(c + \frac{T_j}{\tau_j}\right)^{1-\sigma} - F_j^d(\theta). \tag{3.10}$$

Direct-export profits are decreasing in firms' marginal cost, in trade costs, and increasing in the share of foreign workers.

**Indirect Exports**

In the case of indirect exports, firms must take into account the behaviour of intermediaries. We assume these intermediaries act as wholesalers in a competitive market where free entry drives profits to zero. Following Crozet et al., 2013, we assume that they face a constant entry cost $f \geq 0$. We use a two-stage backward procedure to solve the pricing problem of a firm exporting through an intermediary. We first solve the trade intermediary's problem taking the manufacturer's price as given; then, we solve the manufacturer's problem.

A trade intermediary $i$ buys a specific variety at price $p_j^i$ from the manufacturer and resells it in country $j$ for FOB price $p_j^w$. It faces the same demand curve as a direct exporter and incurs the same transport costs so that consumers in country $j$ face the CIF price $p_j^{w\ \text{CIF}} = p_j^w \tau_j + T_j$. This implies that the intermediary behaves like a direct exporter with a marginal cost equal to $p_j^i$. The maximisation programme of the intermediary as well as its optimal choices are detailed in Appendix 3.A.1.

The optimisation problem for a manufacturer that indirectly exports to country $j$ reads as follows:

$$\max_{p_j^i} \pi_j^i \quad = \quad \left(p_j^i - c\right) q_j \left(p_j^{w\ \text{CIF}}\right) - F_j^{ind} \tag{3.11}$$

with $q_j\left(p_j^{w\ \text{CIF}}\right) = {}^{E_j}/{}_{P_j{}^{1-\sigma}} \left({}^{\sigma}/{}_{\sigma-1}\right)^{-\sigma} \left(p_j^i \tau_j + T_j\right)^{-\sigma}$.

Profit maximisation yields the optimal pricing rule of indirect exporters:

$$p_j^i = \frac{\sigma}{\sigma - 1}\left(c + \frac{T_j}{\sigma \tau_j}\right). \tag{3.12}$$

Final intermediary FOB and CIF prices, indirectly exported quantities to country $j$ and associated profits are:

$$p_j^w = \left(\frac{\sigma}{\sigma-1}\right)^2 \left(c + \frac{2\sigma-1}{\sigma}\frac{T_j}{\sigma\tau_j}\right) \tag{3.13}$$

$$p_j^{w\ \text{CIF}} = \left(\frac{\sigma}{\sigma-1}\right)^2 \left(c\tau_j + T_j\right) \tag{3.14}$$

$$q_j\left(p_j^{w\ \text{CIF}}\right) = \frac{E_j}{P_j^{1-\sigma}}\left(\frac{\sigma}{\sigma-1}\right)^{-2\sigma}\left(c\tau_j + T_j\right)^{-\sigma} \tag{3.15}$$

$$\pi_j^i = \frac{1}{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{-2\sigma}\frac{E_j\tau_j^{-\sigma}}{P_j^{1-\sigma}}\left(c + \frac{T_j}{\tau_j}\right)^{1-\sigma} - F_j^{ind}. \tag{3.16}$$

Similarly to the direct-export case, optimal profits derived from indirect exports are decreasing in the manufacturer's marginal cost. Depending whether or not foreign workers have an impact on fixed indirect-export costs, optimal profits derived from indirect exports may be increasing in the share of foreign workers (similarly to the direct-export case) or independent from the share of foreign workers.

$$\frac{\partial\pi_j^i/\partial c}{\partial\pi_j^d/\partial c} = \left(\frac{\sigma-1}{\sigma}\right)^{\sigma} < 1; \qquad \frac{\partial\pi_j^i/\partial\theta}{\partial\pi_j^d/\partial\theta} = \begin{cases} \frac{\partial F_j^{ind}(\theta)/\partial\theta}{\partial F_j(\theta)/\partial\theta} & \text{if } F_j^{ind} = F_j^{ind}(\theta) \\ 0 & \text{if } F_j^{ind} \text{ fixed} \end{cases} \tag{3.17}$$

### 3.3.3 Production Decisions

#### Operating Cutoffs

We now study a firm's decision to serve a market or not. The firm produces and exports only if it earns non-negative profits. We define three operating cutoffs. The *domestic operating cutoff* $\bar{c}^h$, the *indirect-export operating cutoff* $\bar{c}^i_{j\theta}$ and the *direct-export operating cutoff* $\bar{c}^{d0}_{j\theta}$ are such that $\pi_h\left(\bar{c}^h\right) = 0$, $\pi_j^i\left(\bar{c}^i_{j\theta}\right) = 0$ and $\pi_j^d\left(\bar{c}^{d0}_{j\theta}\right) = 0$ respectively. These cutoffs consist in threshold marginal costs above which firms face negative profits, and below which firms earn positive profits.

Solving for the zero-profit conditions, we can express the three operating cutoffs as follows:

$$\bar{c}^h = \left(\frac{E_h}{\sigma F_h}\right)^{\frac{1}{\sigma-1}} \frac{\sigma-1}{\sigma} P_h \tag{3.18}$$

$$\bar{c}^i_{j\theta} = \left[\frac{1}{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{-2\sigma} \frac{E_j {\tau_j}^{-\sigma}}{{P_j}^{1-\sigma}} \frac{1}{F_j^{ind}}\right]^{\frac{1}{\sigma-1}} - \frac{T_j}{\tau_j} \tag{3.19}$$

$$\bar{c}^{d0}_{j\theta} = \left[\frac{1}{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma} \frac{E_j {\tau_j}^{-\sigma}}{{P_j}^{1-\sigma}} \frac{1}{F_j^d(\theta)}\right]^{\frac{1}{\sigma-1}} - \frac{T_j}{\tau_j}. \tag{3.20}$$

Firms with a marginal cost higher than $\bar{c}^h$ are unable to earn sufficient revenue to cover their fixed operating costs and hence cease operations. Firms with a lower (or equal) marginal cost produce and serve their domestic market. Among them, for firms with a share of foreign workers $\theta$, only firms with a marginal cost lower than (or equal to) $\bar{c}^i_{j\theta}$ find it profitable to export indirectly to country $j$, and only those with a marginal cost lower than (or equal to) $\bar{c}^{d0}_{j\theta}$ find it profitable to export directly to country $j$. Firms that find both types of export modes profitable will choose the one that with higher profits.

### Choice of Export Mode

**Existence of Indirect Exporters.** As noted before, profits from direct exports are more sensitive to marginal costs compared to profits from indirect exports. Yet, in the case of Viet Nam, as shown in Section 3.2, there exists indirect exporters for a wide range of foreign worker shares. Thus, for a given share of foreign workers, there may be indirect as well as direct workers. This implies that, for any share of foreign workers $\theta$, the indirect-export operating cutoff is larger than the direct-export operating cutoff; otherwise no firm would choose to export indirectly (since direct-export profits would always be higher than indirect-export profits). Thus, we assume that $\bar{c}^{d0}_{j\theta} < \bar{c}^i_{j\theta} \forall \theta$, which implies that the following condition holds.

**Condition 1**

$$\frac{\max F_j^{ind}}{F_j^d(1)} < \left(\frac{\sigma-1}{\sigma}\right)^{\sigma} (<1)\,. \tag{3.21}$$

This condition, independent from firm-specific characteristics, establishes an upper bound on the ratio of fixed costs between indirect and direct exports. It implies that the fixed cost of indirect exports must be sufficiently lower than that of direct exports to make indirect exporting a viable and optimal strategy for any share of foreign workers.

**The Direct-Export Cutoff.** We define the *direct-export cutoff* $\bar{c}_{j\theta}^d$ as the marginal cost equalising profits from indirect and direct exports. It is such that $\pi_j^d\left(\bar{c}_{j\theta}^d\right) = \pi_j^i\left(\bar{c}_{j\theta}^d\right)$. Under Condition 1, $\bar{c}_{j\theta}^d$ exists and leads to positive direct-export profit. Solving this equality, we can express the direct-export cutoff as a linear function of the indirect-export operating cutoff:

$$\bar{c}_{j\theta}^d = a_{j\theta}\bar{c}_{j\theta}^i - \left(1-a_{j\theta}\right)\frac{T_j}{\tau_j} \tag{3.22}$$

where $a_{j\theta} = \left\{\frac{F_j^{ind}}{F_j^d(\theta)-F_j^{ind}}\left[(\sigma/\sigma-1)^{\sigma}-1\right]\right\}^{\frac{1}{\sigma-1}} \in (0,1)$ under Condition 1.

If the indirect-export fixed cost does not depend on the share of foreign workers, then $a_{j\theta}$, and thus $\bar{c}_{j\theta}^d$, increase with $\theta$, while $\bar{c}_{j\theta}^i$ is independent from $\theta$. However, if the indirect-export fixed cost varies with the share of foreign workers, then the effect on $a_{j\theta}$ is not straightforward, but depends on which of the two fixed costs is more sensitive to the share of foreign workers, so that $\text{sign}\left(\frac{\partial a_{j\theta_k}}{\partial\theta_k}\right) = \text{sign}\left(\varepsilon_{F_j^{ind}\backslash\theta} - \varepsilon_{F_j^d\backslash\theta}\right)$ where $\varepsilon_{F_j^{ind}\backslash\theta}$ and $\varepsilon_{F_j^d\backslash\theta}$ are the elasticities of $F_j^{ind}$ and $F_j^d$ with respect to $\theta$. For a concrete example, consider the case where the indirect-export fixed cost is proportional to the direct-export fixed cost such that $F_j^{ind}(\theta) = \alpha F_j^d(\theta)$ with $\alpha < 1$. Then $a_{j\theta} = a = \left\{\frac{\alpha}{1-\alpha}\left[(\sigma/\sigma-1)^{\sigma}-1\right]\right\}^{\frac{1}{\sigma-1}}$ does not depend on the share of foreign workers. In this case, although both $\bar{c}_{j\theta}^i$ and $\bar{c}_{j\theta}^d$ increase with $\theta$, $a$ is independent from $\theta$.

For any given share of foreign workers $\theta$, since indirect-export profits decrease less rapidly than direct-export profits with the marginal cost, we know that $\bar{c}^d_{j\theta} < \bar{c}^i_{j\theta}$. Under Condition 1, this implies that firms with a marginal cost below (or equal to) $\bar{c}^d_{j\theta}$ will export directly while those with a marginal cost between $\bar{c}^d_{j\theta}$ and $\bar{c}^i_{j\theta}$ will export indirectly, as long as these cutoffs are positive. As documented in the literature and reflected in our data (see Section 3.2), indirect exporters tend to be smaller in terms of total employment than direct exporters, in line with our model's prediction.

**Existence of Direct Exporters.** For any share of foreign workers, $\bar{c}^d_{j\theta}$ should be positive, otherwise there would not be any direct exporters among firms endowed with that share of foreign workers. In the case of Viet Nam, there are direct exporters for a wide range of foreign worker shares, including firms that do not employ any foreign worker (see Section 3.2). Thus, we assume that $\bar{c}^d_{j\theta} > 0 \ \forall\theta$. Solving this inequality, we get the following condition:

**Condition 2**

$$F^d_j(0) - \min_{\theta}\left(F^{ind}_j\right) < \frac{1}{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\left[1-\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right]\frac{E_j {\tau_j}^{-\sigma}}{{P_j}^{1-\sigma}}\left(\frac{T_j}{\tau_j}\right)^{1-\sigma}. \tag{3.23}$$

Condition 2 implies that the maximum gap between the two exporting fixed cost is not too wide, so that some firms may find direct export more valuable than indirect exports.

Under Conditions 1 and 2, we know that $0 < \bar{c}^d_{j\theta} < \bar{c}^i_{j\theta} \ \forall\theta$. Then, for any share of foreign workers, among exporting firms, there may be both direct and indirect exporters, and direct exporters will necessarily be more productive than indirect exporters.

**Exporting Firms also Serve their Domestic Market.** In our modelling strategy, we assume that exporting firms also serve their domestic market, as shown in the literature (Bernard et al., 2003). This is the case of 64.16 per cent of exporting firms in our sample. Under Conditions 1 and 2, this implies that for any share of foreign workers, the indirect-export operating cutoff is lower than the domestic operating cutoff: $\bar{c}^i_{j\theta} < \bar{c}^h \ \forall\theta$. Solving this inequality, we get the following condition:

**Condition 3**

$$\min_{\theta}\left(F_j^{ind}\right) > \frac{1}{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{-2\sigma}\frac{E_j\tau_j{}^{-\sigma}}{P_j{}^{1-\sigma}}\left[\left(\frac{E_h}{\sigma F_h}\right)^{\frac{1}{\sigma-1}}\frac{\sigma-1}{\sigma}P_h+\frac{T_j}{\tau_j}\right]^{1-\sigma}. \tag{3.24}$$

Condition 3 ensures that exporting indirectly is sufficiently costly that some firms do not find indirect exports profitable and thus remain confined solely to their domestic market. To sum up, for any share of foreign workers, Conditions 1, 2 and 3 respectively rule out the possibility of having direct exporters only, indirect exporters only, and exporters only.

### 3.3.4 Analysis of the Equilibrium

**The Gap Between the Cutoffs**

Under Conditions 1 to 3, the cutoffs satisfy $0 < \bar{c}^d_{j\theta} < \bar{c}^i_{j\theta} < \bar{c}^h$. It implies that, among firms with a share of foreign workers $\theta$, the most productive firms (with a marginal cost $c \le \bar{c}^d_{j\theta}$) export directly, those with medium productivity ($\bar{c}^d_{j\theta} < c \le \bar{c}^i_{j\theta}$) export indirectly, those with low productivity ($\bar{c}^i_{j\theta} < c \le \bar{c}^h$) do not export (but produce for the domestic market), and those with very low productivity ($c > \bar{c}^h$) do not serve any market.

Figure 3.4 reports indirect- and direct-export profits and the associated cutoffs for different shares of foreign workers, assuming that the indirect-export fixed cost is proportional to the direct-export fixed cost. In that case, both $\bar{c}^i_{j\theta}$ and $\bar{c}^d_{j\theta}$ are increasing functions of $\theta$. Figure 3.4 illustrates that the direct-export cutoff is always lower than the indirect-export operating cutoff (under Conditions 1 to 3), and that foreign workers increase both export cutoffs.

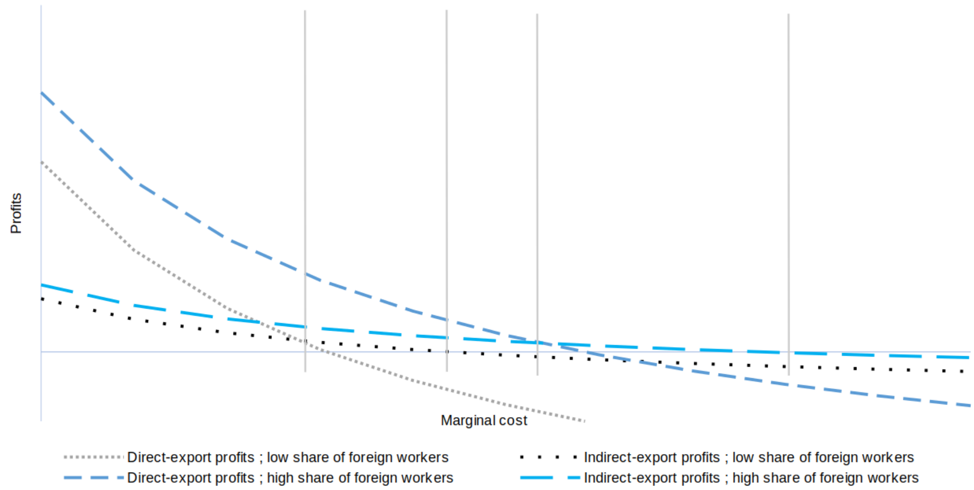



**Figure 3.4** – Indirect- and Direct-Export Profits

Note: Profits from direct and indirect exports as a function of marginal costs, for low and high shares of foreign workers, assuming that the indirect-export fixed cost is proportional to the direct-export fixed cost. For a given share of foreign workers (low or high), the indirect-export operating cutoff is located where indirect-export profits equal zero, and the direct-export cutoff is located where the indirect- and direct-export profits intersect.

Let $\Delta(\theta)$ denote the gap between the indirect-export operating cutoff and the direct-export cutoff. Using equation (3.22), we can write this gap as follows:

$$\Delta(\theta) = \bar{c}^i_{j\theta} - \bar{c}^d_{j\theta} = \left(1 - a_{j\theta}\right)\left(\bar{c}^i_{j\theta} + \frac{T_j}{\tau_j}\right) \geq 0. \tag{3.25}$$

If the indirect-export fixed cost is proportional to the direct-export fixed cost, then $a_{j\theta} = a$ is independent from the share of foreign workers. Then, $\bar{c}^d_{j\theta}$, $\bar{c}^i_{j\theta}$ and $\Delta(\theta)$ are increasing functions of $\theta$. Even though, by assumption, the effect of foreign workers on both export modes' fixed cost is the same, as $\theta$ increases, $\bar{c}^d_{j\theta_k}$ increases less than $\bar{c}^i_{j\theta_k}$, implying that the gap between each cutoff increases. The asymmetry of foreign workers' pro-trade effect on each cutoff comes from the definition of each export cutoff. For the case of indirect exports, it is optimal for a firm to pursue this export strategy the moment it yields non-negative profits. For the case of direct exports, non-negative profits are not sufficient since the firm could also decide to export indirectly. Hence, firms opt for the direct export strategy if it is at least as profitable as the indirect export strategy. This results in a direct-export cutoff that is a linear function of the indirect export cutoff with a slope smaller than one (see equation 3.22). Hence, the pro-trade effect of foreign workers gets dampened for direct-exporters compared to indirect-exporters, when the indirect-export fixed cost is proportional to the direct-export fixed cost.

On the other hand, if foreign workers do not have any effect on the indirect-export fixed cost, then $a_{j\theta}$ and $\bar{c}^d_{j\theta}$ are increasing functions of $\theta$, while $\bar{c}^i_{j\theta}$ is independent from $\theta$. In that case, the gap between the cutoffs $\bar{c}^d_{j\theta}$ and $\bar{c}^i_{j\theta}$ decreases with the share of foreign workers (but remains positive under Conditions 1 to 3).

This is summarised in the following proposition.

**Proposition 4** *Under Conditions 1 to 3,*

- *if the indirect-export fixed cost is proportional to the direct-export fixed cost, then the indirect-export operating cutoff and the direct-export cutoff as well as the difference between these cutoffs are positive and* ***increasing*** *in the share of foreign workers;*
- *if foreign workers do not have any effect on the indirect-export fixed cost, then the indirect-export operating cutoff does not vary with the share of foreign workers, while the direct-export cutoff increases with the share of foreign workers, and the gap between the cutoffs* ***decreases*** *with the share of foreign workers.*

Figure 3.5 shows the cutoffs as a function of the share of foreign workers, when the indirect-export fixed cost is proportional to the direct-export fixed cost. In that case, the gap between the cutoffs increases. However, the relative share of each export mode among exporting firms may not follow the same pattern. It cannot be assumed that the share of indirect exporters is increasing as the share of foreign workers increases. In fact, Proposition 6 reveals that under certain conditions, the opposite may be true.

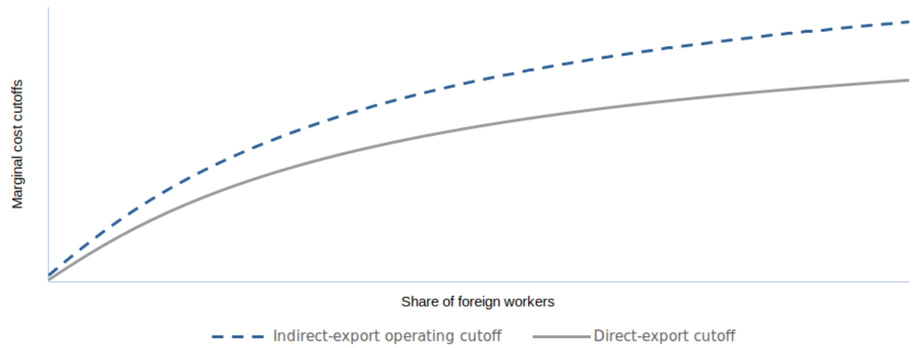



**Figure 3.5** – Indirect-Export Operating Cutoff and Direct-Export Cutoff

Note: Indirect-export operating cutoff and direct-export cutoff as a function of the share of foreign workers, with an increasing gap between the cutoffs.

### Direct and Indirect Exporter Shares

We denote by $\phi$ the cumulative distribution function of marginal costs. Since direct exporters have a marginal cost lower than $\bar{c}^d_{j\theta}$, indirect exporters a marginal cost between $\bar{c}^d_{j\theta}$ and $\bar{c}^i_{j\theta}$, and non-exporters a marginal cost higher than $\bar{c}^i_{j\theta}$, then $\phi\left(\bar{c}^d_{j\theta}\right)$, $\phi\left(\bar{c}^i_{j\theta}\right) - \phi\left(\bar{c}^d_{j\theta}\right)$ and $\phi\left(\bar{c}^i_{j\theta}\right)$ respectively represent the shares of direct exporters, indirect exporters, and exporters (both direct and indirect exporters) among total firms. We assume that $\phi$ and its derivative $\phi'$ are strictly increasing functions of the marginal cost. Following from Proposition 4, these three shares are increasing in the share of foreign workers. This is summarised in the following proposition.

**Proposition 5** *Under Conditions 1 to 3,*

- *if the indirect-export fixed cost is proportional to the direct-export fixed cost, then the shares of direct exporters, indirect exporters, and exporters among total firms* ***are increasing*** *in the share of foreign workers;*
- *if foreign workers do not have any effect on the indirect-export fixed cost, then the share of direct exporters* ***increases*** *in the share of foreign workers, while the share*

*of indirect exporters* ***decreases*** *with the share of foreign workers, and the share of exporters is* ***independent*** *from the share of foreign workers.*

The share of direct exporters among exporters is given by $\phi\left(\bar{c}^{d}_{j\theta}\right)/\phi\left(\bar{c}^{i}_{j\theta}\right)$. If foreign workers do not have any effect on the indirect-export fixed cost, then this share is increasing, since $\bar{c}^{d}_{j\theta}$ increases in the share of foreign workers. On the other hand, if the indirect-export fixed cost is proportional to the direct-export fixed cost, then this share is increasing in the share of foreign workers if and only if:

$$a\phi'\left(\bar{c}^{d}_{j\theta}\right)/\phi\left(\bar{c}^{d}_{j\theta}\right) \geq \phi'\left(\bar{c}^{i}_{j\theta}\right)/\phi\left(\bar{c}^{i}_{j\theta}\right). \tag{3.26}$$

Thus, the impact of foreign workers on the share of direct exporters among exporters depends on the distribution of productivity among firms. In Appendix 3.A.2, we show that the share of direct exporters among exporters increases in the share of foreign workers when firms' productivity follows a Pareto distribution, a common assumption in the literature (see, for example, Helpman et al., 2004; Melitz and Redding, 2015).

**Proposition 6** *Under Conditions 1 to 3, the impact of foreign workers on the share of direct exporters among exporters depends on the distribution of productivity among firms and on whether their impact is confined to direct exports only. This impact is positive when firms' productivity follows a Pareto distribution or when foreign workers do not have any impact on indirect-export fixed cost.*

Under Conditions 1 to 3, Propositions 1 to 3 imply that for any share of foreign workers, high productivity firms export directly and medium productivity firms export indirectly. In addition, if foreign workers have a similar impact on indirect- and direct-export fixed costs, then, when the share of foreign workers increases, the shares of direct and indirect exporters among total firms increase. However, the theoretical model does not allow us to conclude on how the share of foreign workers impact the share of direct exporters among exporters, as this depends on the Pareto shape parameter of the productivity distribution.

## 3.4. Empirical Analysis

We use the 2010 UNIDO Viet Nam Industry Investor Survey to test the predictions of our model. We test the validity of Propositions 4 to 6, before running a series of robustness tests in which we use alternative specifications and sub-samples.

### 3.4.1 Baseline Specification

To test the three predictions of the model, we estimate the following specification:

$$X_i = \beta_0 + \beta_1 \text{For}_i + \beta_2 \ln \text{Size}_i + \Gamma' \text{Ctrls}_i + \gamma_s + \gamma_p + \epsilon_i \tag{3.27}$$

where $X_i$ captures either the (indirect/direct) export probability or the export performance of firm $i$. The export performance is measured as the share of exports over total sales. The independent variables of interest include the share of skilled foreign workers employed by the firm ($\text{For}_i$) and the logarithm of the size of the firm ($\text{Size}_i$). The firm size is captured by the number of permanent full-time workers employed in the previous year. The vector of control variables, denoted $\text{Ctrls}_i$, includes the (log) age of the firm, and a binary variable equal to one for mono-product firms and zero otherwise. The model includes 2-digit sector fixed effects ($\gamma_s$) as well as province fixed effects ($\gamma_p$) to reduce the bias for omitted variables. Finally, we follow the literature by clustering standard errors at the province-sector level, because observations could be highly correlated within province-sector pairs due to agglomeration effects.

### 3.4.2 Endogeneity Concerns

Research on the role of skilled foreign workers in firms' export decisions faces a fundamental problem of causal inference due to reverse causality and omitted confounding factors (see Hiller, 2013; Marchal and Nedoncelle, 2019, for similar endogeneity issues).

First, firms may decide to hire skilled foreign workers according to their export strategy, especially if they are aware of the potential beneficial effects of these workers on their export performance. Some articles show that firms actively prepare to export by increasing their workforce expertise, for instance by hiring workers from other exporters (Masso et al., 2015; Sala and Yalcin, 2015). Second, firms' export mode may affect their ability to attract certain types of workers and thus bias the estimation (Bombardini and Trebbi, 2020). For instance, skilled foreign workers may self-select into direct exporters that are also more productive because they offer higher wages. Therefore, both workers' and firms' decisions are likely to generate a potential upward bias in the estimation of the pro-trade effect of skilled foreign workers.

To ensure identification in spite of potential endogeneity issues, we use an instrumental variable (IV) strategy. The chosen instrument needs to have a significant impact on firms' employment of skilled foreign workers, but should not directly influence firms' export mode. In addition, this instrument should be orthogonal to province and sector characteristics that could simultaneously affect the employment of skilled foreign workers and the export mode decision.

So far, studies intending to tackle similar endogeneity issues using two stage least square strategies have instrumented the share of foreign workers with the lagged employment of foreign workers, the immigration stock in the region, the sector of the firm, or the immigration stock in a neighbouring country (among others, see Hatzigeorgiou and Lodefalk, 2016; Hiller, 2013; Andrews et al., 2017). Some other studies, such as Mitaritonna et al. (2017), use a shift-share instrument which exploits the spatial distribution of immigrants over time (Card, 2001; Bartik, 1991).

Given the cross-sectional nature of the data at hand, instruments exploiting the time variation of foreign employment are excluded. To obtain causal results, we instrument the share of *skilled* foreign workers employed by firm $i$ using the share of *unskilled* foreign workers employed by the firm. The employment of unskilled foreign workers is highly correlated with the supply of skilled foreign workers to which firms are exposed to due to network effects or to the international profile of the firm. The correlation between the shares of skilled and unskilled foreign workers is 11.5 per cent. The employment of unskilled foreign workers should, however, be orthogonal to the firm export mode decisions since unskilled workers do not hold positions in which they can transfer operative knowledge about foreign markets to their employer. The correlation between the export mode of the firm and its employment of skilled foreign workers is equal to 19.7 per cent, while it is equal to 5 per cent for the employment of unskilled foreign workers. The validity of this instrumentation strategy is further discussed below.

### 3.4.3 Main Results

#### Foreign Workers Relax the Productivity Constraint of Exporters

Proposition 4 implies that only the largest and most productive firms export, and that (skilled) foreign workers help firms export by relaxing the constraint they face in terms of size and productivity.

To test this proposition, we first estimate our baseline model (equation 3.27) using the entire sample of firms, including non-exporting firms, where the dependent variable is a binary variable equal to one if firm $i$ exports and zero otherwise. Results are presented in Table 3.1. In column (1), we report the results of an IV-Probit estimation. We find a positive and significant impact of the size of the firm on its probability to export. The share of skilled foreign workers employed by the firm also determines positively its probability to export. Although the instrument is weak, it positively predicts the share of skilled foreign workers. Control variables display the expected signs. Older firms tend to export more, while mono-product firms tend to export less than multi-product firms.

We perform two tests to assess the validity of our results. In column (2), we report the results of a Probit estimation. The coefficient associated to the size of the firm is upward biased compared to column (1), which corrects for endogeneity concerns with an instrumentation strategy. In column (3), we augment our Probit regression adding the instrument used in column (1) as an additional explanatory variable. The size of the firm still has a positive and significant impact on the probability to export. The instrumental variable is significant at the 10% level only while the coefficient associated to the endogenous variable remains positive and significant at the 5% level. This indicates that the instrument has little effect on the probability to export, except through the endogenous variable. In other words, the instrument primarily influences the probability to export indirectly through its impact on the endogenous variable, and does not have a significant direct effect.

In column (4), we add the interaction of the firm size and the share of skilled foreign workers to our baseline IV strategy presented in column (1). In doing so, we test whether the employment of these workers affects how the size of the firm determines its export performance. When the firm employs no skilled foreign workers, the effect of the size on the export probability is significant and positive: A one per cent increase in the size of the firm increases its probability to export by 0.56 percentage point. However, the interaction term is negative which indicates that this effect decreases as the share of skilled foreign workers increases. Here again the instruments are weak, but the stand alone term that instruments for the share of skilled foreign workers positively predicts the share of skilled foreign workers.

We then evaluate at which level of foreign employment the effect of the firm size on its export probability becomes insignificant. We plot the marginal effects of the firm size on the export dummy over the distribution of skilled worker shares in Figure 3.6. We find that the size increases the export probability, yet only for firms employing less than 70 per cent of foreigners among their skilled workers. This is the case of most firms since the average firm employs 15.7 per cent of skilled foreign workers. This result is consistent with Proposition 4: the size of the firm, which is a proxy for its productivity level, matters less for exporting when the firm hires a large share of skilled foreign workers. These workers thus relax the size/productivity constraint faced by exporters. From a theoretical angle, skilled foreign workers shift downward the productivity threshold at which firms can export.

We reproduce this set of results using the export share of the firm as the dependent variable. Results are reported in Appendix, Table A.5 and show that our findings generalise to the intensive margin of trade. We find a positive and significant effect of size on the export share (columns 1 to 4). In addition, hiring skilled foreign workers lowers the size constraint faced by exporters (column 4).

Finally, we estimate our baseline specification (equation 3.27) splitting the sample into four bins of skilled foreign worker shares. The first bin includes all firms not hiring skilled foreign workers and the three remaining bins split the distribution of firms employing a positive share of skilled foreign workers into three sub-samples. Results are reported in Appendix, Table A.6 and show that size impacts more the export probability of firms employing a small share of skilled foreign workers (1st and 2nd bins), than firms hiring a large share of skilled foreign workers (3rd and 4th bins). Foreign workers thus reduce the importance that size plays for exporting.

| | Export dummy | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $\text{For}_i$ | 4.9708*** | 0.9411*** | 0.8493** | 18.5451*** |
| | (0.2537) | (0.3380) | (0.3364) | (2.6790) |
| $\ln \text{Size}_i$ | 0.1295** | 0.2829*** | 0.2844*** | 0.5632*** |
| | (0.0594) | (0.0657) | (0.0666) | (0.0867) |
| $\text{IV}_i$ | | | 11.8466* | |
| | | | (6.5125) | |
| $\text{For}_i * \ln \text{Size}_i$ | | | | -2.5979*** |
| | | | | (0.5432) |
| $\ln \text{Age}_i$ | 0.1944*** | -0.0954 | -0.0902 | 0.1285 |
| | (0.0619) | (0.0952) | (0.0949) | (0.0806) |
| $\text{Mono}_i$ | -0.3050*** | -0.0782 | -0.0772 | -0.1722* |
| | (0.0642) | (0.1085) | (0.1090) | (0.0943) |
| Observations | 1,057 | 1,057 | 1,057 | 1,057 |
| Sector FE | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes |
| Estimator | IV-Probit | Probit | Probit | IV-Probit |
| 1st stage coefficients | 0.7241** | | | 5.4726** ; -2.2368 |
| | (0.3610) | | | (2.2362) ; (2.0164) |
| 1st stage F stat. | 5.99 | | | 6.05 ; 5.74 |

Note: IV-Probit and Probit estimation results. The dependent variable is a binary equal to one if the firm exports and zero otherwise. In columns (1) and (4), the share of skilled foreign workers ($\text{For}_i$) and the interaction term are instrumented using the share of unskilled foreign workers, denoted $\text{IV}_i$. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table 3.1** – Validation of Proposition 1

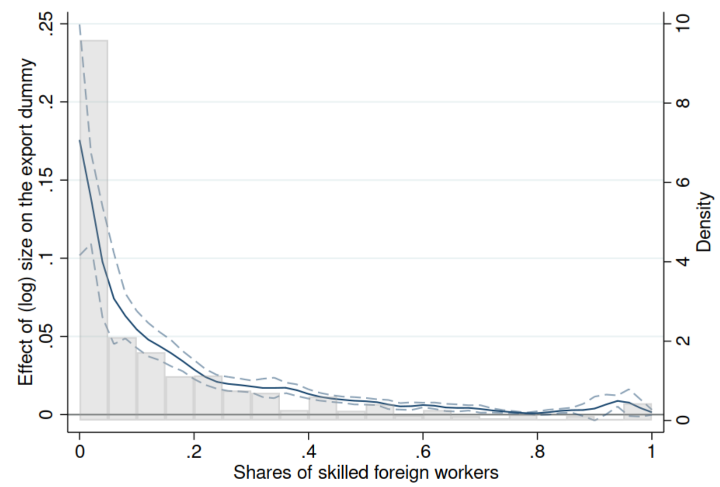



**Figure 3.6** – Marginal Effects of Firm Size on the Export Participation

Note: Marginal effects of (log) size measured as total employment on the export participation at different shares of skilled foreign workers, based on the IV-Probit estimation presented in column (4), Table 3.1. Dashed lines indicate 95% confidence intervals. Size has a statistically significant effect on the export probability when the upper and lower bounds of the confidence interval are either both above or both below zero. The histogram and the right vertical axis depict the distribution of our sample over shares of skilled foreign workers.

### Foreign Workers Facilitate Exports

According to Proposition 5, the shares of exporters, indirect exporters, and direct exporters *among total firms* should increase with the employment of skilled foreign workers. In other words, we expect the export probability of the firm to increase with the employment of skilled foreign workers, in general and whether it exports through an intermediary or directly.

We already investigated the effect of skilled foreign workers on the probability to export (disregarding the export mode of the firm) in Table 3.1, column (1). We found that a one per cent increase in the share of skilled foreign workers employed by a firm increases its probability to export by 4.97 percentage points.

We further test the validity of Proposition 5 using two alternative dependent variables. Results are reported in Table 3.2. In column (1), the dependent variable is a binary equal to one if the firm is exporting indirectly and zero otherwise. Note that the variable equals one whether the firm exports only indirectly, or uses both export modes (indirect and direct exports). In column (2), the dependent variable is a binary equal to one if the firm exports directly and zero otherwise. Here again, the variable equals one whether the firm exports only directly, or uses both export modes.

We find no significant effect of the share of skilled foreign workers on the probability to export indirectly (column 1). This may be due to the fact that when the share of skilled foreign workers increases, some firms that were not exporting start exporting indirectly, while some firms that were exporting indirectly start exporting directly. The two flows may compensate each other so that the mean effect of an increase in the share of foreign workers seems null. On the contrary, we find a strong and positive effect on the probability to export directly (column 2). A one per cent increase in the share of skilled foreign workers leads to a significant 4.64 percentage point increase in the probability to export indirectly. In sum, the share of exporters among total firms increases with the share of skilled foreign workers employed by the firm, and this increase is driven by direct exporters. This finding reinforces the theoretical predictions from our model under the assumption of a Pareto distribution, as put forward in Proposition 6.

Control variables are either non significant (column 1) or display the expected sign. The size of the firm in terms of employment has a positive impact on exporting directly (column 2). Older firms tend to export more directly while mono-product firms tend to export less directly (column 2). Finally, the instrument is weak, but it positively predicts the share of skilled foreign workers in both columns.

| | Indirect export dummy | Direct export dummy |
|---|---|---|
| | (1) | (2) |
| $\text{For}_i$ | 0.4121 | 4.6433*** |
| | (1.1457) | (0.2730) |
| $\ln \text{Size}_i$ | -0.0050 | 0.1473** |
| | (0.0584) | (0.0649) |
| $\ln \text{Age}_i$ | 0.1332 | 0.1508** |
| | (0.1216) | (0.0734) |
| $\text{Mono}_i$ | -0.2607 | -0.2904*** |
| | (0.1687) | (0.0731) |
| Observations | 837 | 899 |
| Sector FE | yes | yes |
| Province FE | yes | yes |
| Estimator | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.6910** | 0.7159** |
| | (0.3358) | (0.3521) |
| 1st stage F stat. | 5.03 | 4.87 |

Note: IV-Probit estimation results. The dependent variable is a binary equal to one if the firm exports indirectly and zero otherwise in column (1), and a binary equal to one if the firm exports directly and zero otherwise in column (2). Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table 3.2** – Validation of Proposition 2

### Foreign Workers Facilitate More Direct Exports

Proposition 6 predicts that the share of direct exporters *among exporters* is increasing in the share of skilled foreign workers, when firms' productivity follows a Pareto distribution. This implies that these workers can be seen as helping firms to access foreign markets for both export modes, yet even more for direct exports.

The results presented in Table 3.2 already point out that skilled foreign workers help firms to export directly, rather than indirectly. To further test proposition 6, we estimate a similar model as before on the sub-sample of exporting firms. Results are reported in Table 3.3. In column (1), the dependent variable is a binary equal to one if the firm exports only directly and zero if it exports only indirectly. The sample thus excludes firms using both export modes. We find that skilled foreign workers increase significantly the probability of their firms to export directly (versus indirectly). Among exporting firms, a 1 per cent increase in the share of skilled foreign workers leads to a 3.44 percentage point increase in the probability to export directly (versus indirectly).

We confirm this result in column (2), where the dependent variable is a binary equal to one if the firm exports larger quantities directly than indirectly. The sample thus includes all exporting firms, including those using both export modes. Among all exporting firms, a 1 per cent increase in the share of skilled foreign workers leads to a 3.22 percentage point increase in the probability to export more directly than indirectly. Together with Table 3.2, these findings validate Proposition 6 according to which foreign workers facilitate more direct exports than indirect exports (under reasonable assumptions on the distribution of firms' productivity). These results suggest that indirect exporters become direct exporters at a stronger pace than non-exporters become indirect exporters, as suggested by the results in Table 3.2.

| | Direct export dummy | |
|---|---|---|
| | Sample of exporting firms | |
| | (1) | (2) |
| $For_i$ | 3.2174** | 3.4393*** |
| | (1.4453) | (0.9634) |
| $\ln Size_i$ | 0.1328* | 0.1499*** |
| | (0.0700) | (0.0566) |
| $\ln Age_i$ | 0.0919 | 0.0789 |
| | (0.1562) | (0.1505) |
| $Mono_i$ | -0.2741 | -0.2152 |
| | (0.1769) | (0.1400) |
| Observations | 485 | 623 |
| Sector FE | yes | yes |
| Province FE | yes | yes |
| Estimator | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.5951** | 0.6629** |
| | (0.2543) | (0.3033) |
| 1st stage F stat. | 2.96 | 3.58 |

Note: IV-Probit estimation results. The dependent variable is a binary equal to one if the firm exports directly and zero if it exports indirectly in column (1), and a binary equal to one if the firm exports more directly than indirectly in column (2). Column (1) thus excludes firms using both export modes. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table 3.3** – Validation of Proposition 3

### 3.4.4 Robustness Tests

We report a set of robustness test in Tables A.7 to A.12, where we use alternative model specifications and samples of observations. All results are reported in the Appendix and discussed hereafter.

#### Alternative Model Specifications

Results reported in Tables A.7 to A.9 demonstrate the robustness of our findings to alternative model specifications, for each of the three propositions. First, in columns (1) and (2), we control for the share of foreign ownership. This additional variable controls for the fact that skilled foreign workers may be posted workers or expatriates when hired by a foreign owned firm. Adding control variable is challenging given the small size and the cross-sectional nature of our sample. For each of the three propositions, we obtain results that are in line with the baseline findings. The share of foreign ownership does not impact the dependent variable except in the first specification of Table A.9 where it has a negative and significant effect. However, the share of foreign ownership has a positive and significant impact on the first stage regression, that is a positive effect on the share of high skilled foreign workers hired by the firm.

In columns (3) and (4), we use an alternative proxy for the size of the firm, that is the logarithm of the total assets of the firm. Although the effect of size is no longer significant (except in Table A.7, column 4), the coefficients associated to skilled foreign workers and the associated interaction term (in Table A.7, column 4) remain significant and in line with the baseline results.

In columns (5) and (6), we use an alternative measure for the employment of skilled foreign workers: a binary variable equal to one if the firm employs at least one skilled foreign worker and zero otherwise, instead of using the share of skilled foreign workers as in the baseline specification. Except for the regressions related to Proposition 4 where the coefficients are no longer significant when adding the interaction term, the effect of skilled foreign workers is in line with the baseline findings. Finally, in some cases, the effect of the firm size is negative, suggesting that the probability to hire at least one skilled foreign worker is, on average, negatively correlated with the firm size (Table A.7, column 6 and Table A.8, column 6).

In order to test the robustness of our results to the use of alternative identification strategies, we use propensity score matching, employing the doubly robust estimator of Lunceford and Davidian (2004). Results are reported in the Appendix, in section 3.A.5. In a first step, we estimate the probability We report the results of this estimator in Table A.14. We find that the effect of skilled foreign workers on the export probability and the probability to export directly is consistent with the baseline findings, although the magnitude of the effect is smaller. Similarly to the baseline results, we fail to find a significant effect of skilled foreign workers on the probability to export indirectly.

**Alternative Samples**

Results reported in Tables A.10 to A.12 show the robustness of our findings to the use of alternative samples of observations, for each of the three propositions. We perform these tests to exclude the hypothesis that our results are driven by a sample selection bias induced by the small size and the survey nature of the data at hand. First, we exclude non-manufacturing firms in columns (1) and (2), and state-owed firms in columns (3) and (4). Then, we exclude the top-5 per cent of firms in terms of foreign capital in columns (5) and (6). We keep multinational firms in columns (7) and (8). In Tables A.10 and A.11, we exclude firms using both export modes in columns (9) and (10) as it is unclear whether exporting both indirectly and directly is an export activity that is more or less complex and costly than exporting using one export mode only. Finally, in the last two columns of Tables A.10 to A.12, we exclude exporting firms that do not serve their domestic market. For each of these samples, we obtain very similar results to the baseline findings.

## 3.5. Conclusions

The pro-trade effect of skilled foreign workers on firm export performance in developed economies is well-documented in both the empirical and theoretical literatures (Hatzigeorgiou and Lodefalk, 2021). Likewise, recent studies have analysed the role trade intermediaries play in the export process, along with the reasons behind firms' decisions to engage in trade through this channel (Abel-Koch, 2013; Felbermayr and Jung, 2011; Crozet et al., 2013). Our paper lies at the nexus of these two seemingly related yet distinct strands of literature. Drawing on Crozet et al., 2013, we build a model featuring heterogeneous firms, an intermediary sector, and foreign workers. Our model predicts that a reduction in the fixed export cost for both direct and indirect exports due to foreign workers leads to an increase in the shares of direct and indirect exporters among all firms. Additionally, under the assumption that firm productivity follows a Pareto distribution, as is standard in the trade literature, our model predicts that the share of direct exporters among exporters increases in the share of foreign workers.

We leverage the 2010 UNIDO Viet Nam Industry Investor Survey to study the influence of skilled foreign workers on firms' export modes. Our contribution is twofold. First, in line with the model's predictions, we find that these workers relax the productivity constraints faced by firms seeking access to foreign markets. Specifically, an increase in the proportion of skilled foreign workers is associated with a reduced effect of the size of the firm on its likelihood of exporting. This implies that firms employing skilled foreign workers can increase their profits by serving foreign markets, capitalizing on the presence of reduced fixed export costs and the associated increasing returns to scale. This finding is in line with the underlying assumption that skilled foreign workers help their employing firms thanks to their business network. Second, we find that skilled foreign workers help their employing firm export directly, while we do not find an impact on the average firm's likelihood of engaging in indirect exporting. The latter finding comes with a caveat when interpreted through the lens of our theoretical model: although foreign workers do indeed impact both export modes, if we assume a Pareto productivity distribution, the number of non-exporters transitioning into indirect exporters might be smaller than the number of indirect exporters transitioning into direct exporters, depending on the shape of the Pareto tail, rendering the effect virtually invisible in a cross-sectional analysis. Furthermore, given that our dataset oversamples large firms, which are at the right tail of the productivity distribution, the data might not be informative enough to detect the pro-trade effect of skilled foreign workers on indirect exporters.

Our focus on Viet Nam aligns with the emerging yet growing body of literature on the role intermediaries play in developing economies. Our contribution to this literature lies in studying the role of skilled foreign workers. To the best of our knowledge, this is the first paper that jointly investigates the pro-trade effect of skilled foreign workers and trade intermediaries in the context of a developing economy. This is particularly relevant for Southeast Asian economies, which have pursued development strategies grounded in trade openness, implementing significant trade liberalisation reforms in the 1990s. It is well-established that economic under-development results in an economic environment that diminishes both firm-level and aggregate productivities (Banerjee and Moll, 2010; Moll, 2014). Factors that mitigate productivity constraints in such environments, enabling firms to enhance their potential, yield positive aggregate externalities and consequently warrant further investigation. Our findings show that the employment of skilled foreign workers is one such influential factor.

Future research could extend our analysis in several ways. First, on the theoretical side, an interesting avenue for future research would be to explore the possible microfoundations that underpin the pro-trade effect of skilled foreign workers in the context of our model. This could be achieved by endogenizing the presence of skilled foreign workers in the model, and studying the implications of this endogeneity for firms' export decisions.

Second, while the UNIDO Industry Investor Survey offers valuable insights into firms' operations in developing countries, the cross-sectional nature of the data is a severe limitation to our empirical analysis, suggesting a direction for future research. Subsequent studies on this field could leverage panel data to track firms' export strategies over time, thereby precisely identifying the pro-trade impact of skilled foreign workers put forward in this study. In particular, such data would allow to study firms' transition between non-exporting, indirect exporting, and direct exporting status, and to investigate the role of skilled foreign workers in these transitions.

# Appendix 3.A Supplementary On-line Appendix

## 3.A.1 Maximisation Programmes

The maximisation programme of firm $k$ for domestic production is:

$$\max_{p_{kh}} \pi_{kh} = \left(p_{kh} - c_k\right) q_{kh}\left(p_{kh}\right) - F_h \tag{A.1}$$

with $q_{kh}\left(p_{kh}\right) = {}^{(p_{kh})^{-\sigma} E_h}/{}_{P_h{}^{1-\sigma}}$ according to equation (3.3).

The maximisation programme of firm $k$ in country $h$ for direct export to country $j \neq h$ is:

$$\max_{p_{kj}} \pi^d_{kj} = \left(p_{kj} - c_k\right) q_{kj}\left(p^{\text{CIF}}_{kj}\right) - F_j\left(\theta_k\right) \tag{A.2}$$

with $q_{kj}\left(p^{\text{CIF}}_{kj}\right) = {}^{\left(p^{CIF}_{kj}\right)^{-\sigma} E_j}/{}_{P_j{}^{1-\sigma}}$ according to equation (3.3), and $p^{\text{CIF}}_{kj} = p_{kj}\tau_j + T_j$.

In case of indirect export, the maximisation programme of an intermediary taking the price of firm $k$ as given is:

$$\max_{p^w_{kj}} \pi^w_{kj} = \left(p^w_{kj} - p^i_{kj}\right) q_{kj}\left(p^{w\ \text{CIF}}_{kj}\right) - f \tag{A.3}$$

with $q_{kj}\left(p^{w\ \text{CIF}}_{kj}\right) = {}^{\left(p^{w\ \text{CIF}}_{kj}\right)^{-\sigma} E_j}/{}_{P_j{}^{1-\sigma}}$ according to equation (3.3), and $p^{w\ \text{CIF}}_{kj} = p^w_{kj}\tau_j + T_j$.

Profit maximisation yields the optimal prices and quantities for the intermediary as a function of manufacturer $k$'s price:

$$p^{w}_{kj} = \frac{\sigma}{\sigma - 1}\left(p^{i}_{kj} + \frac{T_j}{\sigma\tau_j}\right), \tag{A.4}$$

$$p^{w\ \mathrm{CIF}}_{kj} = \frac{\sigma}{\sigma - 1}\left(p^{i}_{kj}\tau_j + T_j\right), \tag{A.5}$$

$$q_{kj}\left(p^{w\ \mathrm{CIF}}_{kj}\right) = \frac{E_j}{{P_j}^{1-\sigma}}\left(\frac{\sigma}{\sigma - 1}\right)^{-\sigma}\left(p^{i}_{kj}\tau_j + T_j\right)^{-\sigma}. \tag{A.6}$$

### 3.A.2 Proof of Proposition 6

The share of direct exporters among exporters is given by $\phi\left(\bar{c}^{d}_{j\theta_k}\right)/\phi\left(\bar{c}^{i}_{j\theta_k}\right)$. Differentiating with respect to $\theta_k$ and rearranging, we get:

$$\frac{\mathrm{d}}{\mathrm{d}\theta_k}\left[\frac{\phi\left(\bar{c}^{d}_{j\theta_k}\right)}{\phi\left(\bar{c}^{i}_{j\theta_k}\right)}\right] = \frac{\phi\left(\bar{c}^{d}_{j\theta_k}\right)}{\phi\left(\bar{c}^{i}_{j\theta_k}\right)}\left[\frac{1}{\phi\left(\bar{c}^{d}_{j\theta_k}\right)}\frac{\mathrm{d}\phi\left(\bar{c}^{d}_{j\theta_k}\right)}{\mathrm{d}\theta_k} - \frac{1}{\phi\left(\bar{c}^{i}_{j\theta_k}\right)}\frac{\mathrm{d}\phi\left(\bar{c}^{i}_{j\theta_k}\right)}{\mathrm{d}\theta_k}\right] \tag{A.7}$$

$$= \frac{\phi\left(\bar{c}^{d}_{j\theta_k}\right)}{\phi\left(\bar{c}^{i}_{j\theta_k}\right)}\frac{\mathrm{d}\bar{c}^{i}_{j\theta_k}}{\mathrm{d}\theta_k}\left[a\frac{\phi'\left(\bar{c}^{d}_{j\theta_k}\right)}{\phi\left(\bar{c}^{d}_{j\theta_k}\right)} - \frac{\phi'\left(\bar{c}^{i}_{j\theta_k}\right)}{\phi\left(\bar{c}^{i}_{j\theta_k}\right)}\right]. \tag{A.8}$$

Thus, the share of direct exporters among exporters is increasing in the share of foreign workers if and only if:

$$a\frac{\phi'\left(\bar{c}^{d}_{j\theta_k}\right)}{\phi\left(\bar{c}^{d}_{j\theta_k}\right)} \geq \frac{\phi'\left(\bar{c}^{i}_{j\theta_k}\right)}{\phi\left(\bar{c}^{i}_{j\theta_k}\right)}. \tag{A.9}$$

Inequality A.9 remains inconclusive without specifying a functional form for $\phi$. Yet, the firm size distribution in terms of both revenue and employees is documented to display power law behaviour in the right tail. Given that our sample of Vietnamese firms is restricted to firms with over 225,00 USD in capital stock, the power-law approximation is particularly well-suited to represent it. We can thus assume that firm productivity is Pareto-distributed.

Suppose that, in country $h$, firm productivity is distributed according to a Pareto distribution. By definition, productivity $z$ is the inverse of marginal cost $c$, so that $c = 1/z$. Denote its cumulative distribution function by $F_{z_k}(z) = \mathrm{P}\{z_k \leq z\} = 1 - (z_h/z)^{\eta}$, with $\eta > 1$ and $z_h = 1/\bar{c}^h$. According to the model, firms with a marginal cost above $\bar{c}^h$ (defined in equation 3.18) do not serve the market, so that the probability of firm $k$ with productivity $z_k < z_h$ to be active in the market is zero.

We derive the marginal cost distribution from the productivity distribution (with support on the interval $(0, \bar{c}^h]$):

$$\phi(c) = \mathrm{P}\{c_k \leq c\} \tag{A.10}$$

$$= 1 - F_{z_k}\left(\frac{1}{c}\right) \tag{A.11}$$

$$= \left(\frac{c}{\bar{c}^h}\right)^{\eta} \tag{A.12}$$

Taking the derivative with respect to $c$ we get

$$\phi'(c) = \frac{\eta}{c}\phi(c) \tag{A.13}$$

Plugging that result in equation A.8 and using equation 3.22, we get:

$$\frac{\mathrm{d}}{\mathrm{d}\theta_k}\left[\frac{\phi\left(\bar{c}^d_{j\theta_k}\right)}{\phi\left(\bar{c}^i_{j\theta_k}\right)}\right] = \frac{\phi\left(\bar{c}^d_{j\theta_k}\right)}{\phi\left(\bar{c}^i_{j\theta_k}\right)} \frac{\mathrm{d}\bar{c}^i_{j\theta_k}}{\mathrm{d}\theta_k}\left[(1-a)\frac{\eta}{c_{\bar{j\theta_k}}{}^d c_{\bar{j\theta_k}}{}^i}\frac{T_j}{\tau_j}\right] \geq 0 \tag{A.14}$$

The share of direct exporters among exporters is thus increasing in the share of foreign workers when firm productivity is Pareto-distributed.

### 3.A.3 Descriptive Statistics

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Age of the firm | 12.985 | 10.198 | 2 | 87 | 1,152 |
| Nr. of permanent full-time employees | 620.012 | 1218.19 | 7 | 18650 | 1,150 |
| Sh. of skilled workers among permanent full-time employees | 0.138 | 0.117 | 0.002 | 0.967 | 1,150 |
| Sh. of foreigners among permanent full-time employees | 0.017 | 0.039 | 0 | 0.889 | 978 |
| Sh. of foreigners among skilled permanent full-time employees | 0.157 | 0.224 | 0 | 1 | 976 |
| Total costs (in US$) | 3.42e+07 | 3.03e+08 | 0 | 7.26e+09 | 1,048 |
| Total wage bill (in US$) | 1.48e+06 | 3.82e+06 | 0 | 8.00e+07 | 1,143 |
| Total fixed assets (in US$) | 5.90e+07 | 5.23e+08 | 5,860 | 9.34e+09 | 1,137 |
| Total sales (in US$) | 5.32e+07 | 5.17e+08 | 12,599 | 1.10e+10 | 1,150 |
| Mono-product firm dummy | 0.347 | 0.476 | 0 | 1 | 1,152 |
| Multinational firm dummy | 0.631 | 0.483 | 0 | 1 | 1,152 |
| Sh. of foreign ownership | 0.607 | 0.477 | 0 | 1 | 1,152 |
| Exporter dummy | 0.701 | 0.458 | 0 | 1 | 1,152 |
| Indirect exporter dummy | 0.112 | 0.316 | 0 | 1 | 1,103 |
| Direct exporter dummy | 0.691 | 0.462 | 0 | 1 | 1,103 |
| Exporter using both export modes dummy | 0.068 | 0.251 | 0 | 1 | 1,152 |
| Nr. of destinations served | 1.748 | 1.705 | 0 | 9 | 1,103 |

*Note:* Summary statistics for the main variables of interest for the baseline sample of firms.

**Table A.1** – Summary Statistics

| Variable | Non-exporters N | Non-exporters Mean | Exporters N | Exporters Mean | Diff. | p-value |
|---|---|---|---|---|---|---|
| Age of the firm | 344 | 16.393 | 808 | 11.534 | 4.534 | 0 |
| Nr. of permanent full-time employees | 344 | 341 | 806 | 739 | -398 | 0 |
| Sh. of skilled workers among permanent full-time employees | 344 | 0.187 | 806 | 0.117 | 0.067 | 0 |
| Sh. of foreigners among permanent full-time employees | 247 | 0.011 | 731 | 0.019 | -0.009 | 0 |
| Sh. of foreigners among skilled permanent full-time employees | 246 | 0.081 | 730 | 0.182 | -0.102 | 0 |
| Total costs (in US$) | 324 | 1.73e+07 | 724 | 4.17e+07 | -2.44e+07 | 0.074 |
| Total wage bill (in US$) | 342 | 1.06e+06 | 801 | 1.66e+06 | -604,310 | 0.001 |
| Total fixed assets (in US$) | 339 | 2.18e+07 | 798 | 7.47e+07 | -5.29e+07 | 0.018 |
| Total sales (in US$) | 343 | 2.37e+07 | 807 | 6.57e+07 | -4.20e+07 | 0.056 |
| Mono-product firm dummy | 344 | 0.343 | 808 | 0.349 | -0.006 | 0.845 |
| Multinational firm dummy | 344 | 0.293 | 808 | 0.775 | -0.481 | 0 |
| Sh. of foreign ownership | 344 | 0.263 | 808 | 0.754 | -0.491 | 0 |
| Nr. of destinations served | 295 | 0.000 | 808 | 2.386 | -2.386 | 0 |

*Note:* Summary statistics for the main variables of interest and independent group t-tests between sub-samples of non-exporters and exporters for a number of firm characteristics.

**Table A.2** – Characteristics of Non-Exporting and Exporting Firms. Firms using both export modes are included in the sample of exporting firms.

| | Indirect exporters | | Direct exporters | | | |
|---|---|---|---|---|---|---|
| | **N** | **Mean** | **N** | **Mean** | **Diff.** | **p-value** |
| Age of the firm | 46 | 12.239 | 684 | 11.179 | 1.061 | 0.473 |
| Nr. of permanent full-time employees | 46 | 468 | 682 | 764 | -295 | 0.004 |
| Sh. of skilled workers among permanent full-time employees | 46 | 0.112 | 682 | 0.116 | -0.004 | 0.768 |
| Sh. of foreigners among permanent full-time employees | 41 | 0.028 | 620 | 0.018 | 0.009 | 0.087 |
| Sh. of foreigners among skilled permanent full-time employees | 41 | 0.285 | 619 | 0.176 | 0.109 | 0.017 |
| Total costs (in US$) | 42 | 8.73e+06 | 613 | 4.60e+07 | -3.72e+07 | 0.022 |
| Total wage bill (in US$) | 46 | 894,836 | 677 | 1.73e+06 | -832,101 | 0.001 |
| Total fixed assets (in US$) | 46 | 8.95e+06 | 676 | 8.50e+07 | -7.60e+07 | 0.004 |
| Total sales (in US$) | 46 | 9.82e+06 | 683 | 7.34e+07 | -6.35e+07 | 0.014 |
| Mono-product firm dummy | 46 | 0.369 | 684 | 0.359 | 0.010 | 0.895 |
| Multinational firm dummy | 46 | 0.696 | 684 | 0.780 | -0.085 | 0.233 |
| Sh. of foreign ownership | 46 | 0.696 | 684 | 0.760 | -0.064 | 0.367 |
| Nr. of destinations served | 46 | 1.804 | 684 | 2.373 | -0.569 | 0.007 |

*Note:* Summary statistics for the main variables of interest and independent group t-tests between sub-samples of indirect-only and direct-only exporters for a number of firm characteristics. Firms using both export modes are excluded from these sub-samples.

**Table A.3** – Characteristics of Indirect and Direct Exporting Firms

| | UNIDO | | | | | World Bank | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Mean** | **Std. Dev.** | **Min.** | **Max.** | **N** | **Mean** | **Std. Dev.** | **Min.** | **Max.** | **N** |
| Full sample | | | | | | | | | | |
| Nr. of permanent full-time employees | 736.374 | 1,442.450 | 50 | 18,650 | 714 | 658.496 | 1,119.433 | 50 | 7,200 | 125 |
| Total wage bill (in US$) | 1.70e+06 | 4.25e+06 | 0 | 8.00e+07 | 709 | 3.66e+10 | 1.18e+11 | 4.00e+07 | 1.20e+12 | 122 |
| Mono-product firm dummy | 0.392 | 0.489 | 0 | 1 | 716 | 0.624 | 0.486 | 0 | 1 | 125 |
| Sh. of foreign ownership | 0.961 | 0.138 | 0.100 | 1 | 716 | 0.826 | 0.291 | 0.100 | 1 | 122 |
| Exporter dummy | 0.862 | 0.345 | 0 | 1 | 716 | 0.896 | 0.306 | 0 | 1 | 125 |
| Indirect exporter dummy | 0.130 | 0.337 | 0 | 1 | 692 | 0.184 | 0.389 | 0 | 1 | 125 |
| Direct exporter dummy | 0.848 | 0.359 | 0 | 1 | 692 | 0.792 | 0.408 | 0 | 1 | 125 |
| Indirect exporters | | | | | | | | | | |
| Nr. of permanent full-time employees | 564.422 | 781.606 | 58 | 5,890 | 90 | 831.478 | 1,669.007 | 70 | 7,200 | 23 |
| Total wage bill (in US$) | 1.22e+06 | 1.50e+06 | 0 | 9.00e+06 | 90 | 4.37e+10 | 7.96e+10 | 2.54e+08 | 2.80e+11 | 22 |
| Mono-product firm dummy | .322 | 0.470 | 0 | 1 | 90 | 0.739 | 0.449 | 0 | 1 | 23 |
| Sh. of foreign ownership | 0.971 | 0.134 | 0.100 | 1 | 90 | 0.816 | 0.331 | 0.100 | 1 | 22 |
| Direct exporters | | | | | | | | | | |
| Nr. of permanent full-time employees | 803.386 | 1,572.366 | 50 | 18,650 | 585 | 702.758 | 1,038.783 | 60 | 6,200 | 99 |
| Total wage bill (in US$) | 1.78e+06 | 4.58e+06 | 0 | 8.00e+07 | 582 | 3.96e+10 | 1.28e+11 | 4.00e+08 | 1.20e+12 | 98 |
| Mono-product firm dummy | 0.383 | 0.487 | 0 | 1 | 587 | 0.596 | 0.493 | 0 | 1 | 99 |
| Sh. of foreign ownership | 0.971 | 0.121 | 0.100 | 1 | 587 | 0.824 | 0.282 | 0.130 | 1 | 97 |

*Note:* Summary statistics for firm characteristics common across the 2010 Viet Nam Industry Investor Survey and the 2009 World Bank Enterprise Survey, for firms larger than 50 employees with at least 10% of foreign ownership. The first, second and third panels show the characteristics of the full sample, the sub-sample of indirect-only and the sub-sample of direct-only exporters respectively. Firms using both export modes are excluded from these sub-samples.

**Table A.4** – Comparison of the 2010 UNIDO Viet Nam Industry Investor Survey and the 2009 World Bank Enterprise Survey

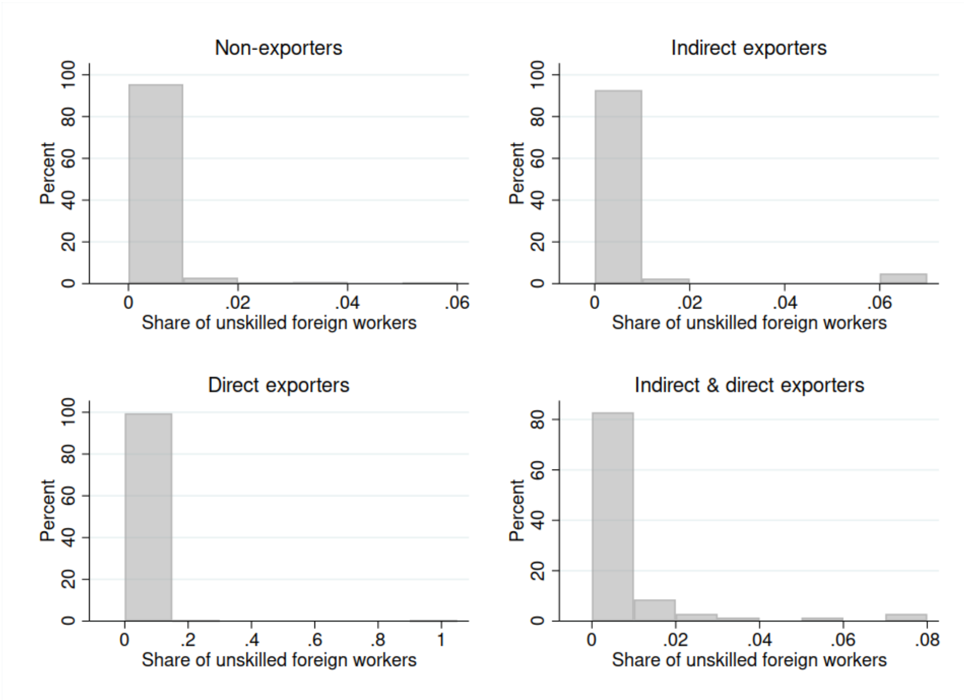



**Figure A.1** – Share of Unskilled Foreign Workers by Export Status

*Note*: The four figures depict the distributions of the shares of unskilled foreign workers observed across non-exporters, indirect-only exporters, direct-only exporters, and firms using both export modes.

### 3.A.4 Additional Results

| | Export share | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $For_i$ | 4.3669* | 0.1555*** | 0.1529*** | 2.6712*** |
| | (0.2051) | (0.0585) | (0.0582) | (1.2084) |
| $\ln Size_i$ | 0.0730*** | 0.0708*** | 0.0708*** | 0.1346*** |
| | (0.0128) | (0.0128) | (0.0128) | (0.0333) |
| $IV_i$ | | | 0.1563 | |
| | | | (0.1936) | |
| $For_i * \ln Size_i$ | | | | -0.3774** |
| | | | | (0.1818) |
| $\ln Age_i$ | -0.1295*** | -0.1393*** | -0.1392*** | -0.1200*** |
| | (0.0217) | (0.0203) | (0.0203) | (0.0243) |
| $Mono_i$ | 0.0620*** | 0.0747*** | 0.0747*** | 0.0592** |
| | (0.0214) | (0.0195) | (0.0195) | (0.0249) |
| Sh. of foreign ownership | 0.0620*** | 0.0747*** | 0.0747*** | 0.0592** |
| | (0.0214) | (0.0195) | (0.0195) | (0.0249) |
| Observations | 1,093 | 1,093 | 1,093 | 1,093 |
| Sector FE | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes |
| Estimator | IV-2SLS | OLS | OLS | IV-2SLS |
| R-squared | | 0.0985 | 0.0987 | |
| 1st stage coefficients | 0.7303** | | | 5.5185** ; -2.2756 |
| | (0.3710) | | | (2.2755) ; (2.0544) |
| 1st stage F stat. | 3.88 | | | 8.14 ; 6.67 |

Note: IV-2SLS and OLS estimation results. The dependent variable is the share of exports over total sales. In columns (1) and (4), the share of skilled foreign workers ($For_i$) and the interaction term are instrumented using the share of unskilled foreign workers, denoted $IV_i$. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.5** – Validation of Proposition 1 - Export Share

| | Export dummy | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\ln \text{Size}_i$ | 0.2881*** | 0.2419* | 0.1596 | 0.2511 | 0.0489** |
| | (0.0888) | (0.1339) | (0.2272) | (0.1615) | (0.0227) |
| $\ln \text{Size}_i$ * bin 2 | | | | | 0.0507* |
| | | | | | (0.0292) |
| $\ln \text{Size}_i$ * bin 3 | | | | | 0.0405 |
| | | | | | (0.0305) |
| $\ln \text{Size}_i$ * bin 4 | | | | | 0.0122 |
| | | | | | (0.0313) |
| $\ln \text{Age}_i$ | 0.0198 | -0.0908 | -0.6470 | -0.0124 | 0.1618893 |
| | (0.1266) | (0.2596) | (0.4064) | (0.3534) | (0.0784) |
| $\text{Mono}_i$ | -0.1948 | -0.4452 | -0.2554 | 0.1886 | -0.2182 |
| | (0.1804) | (0.2733) | (0.3709) | (0.2588) | (0.0986) |
| Bins (sh. of skilled for. workers) | 1 | 2 | 3 | 4 | All (Dummies) |
| Observations | 373 | 159 | 138 | 151 | 1238 |
| Sector FE | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes |
| Estimator | Probit | Probit | Probit | Probit | Probit |

Note: Probit estimation results. The dependent variable is a binary equal to one if the firm exports and zero otherwise. Column (1) includes all firms not hiring any skilled foreign workers and columns (2) to (4) split the distribution of firms employing a positive share of skilled foreign workers into three subsamples. Column (5) includes all bins as dummies, including the one for firms not hiring any skilled foreign workers, interacted with the size of the firm. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.6** – Validation of Proposition 1 - Bins of Foreign Employment

| | Export dummy | | | | | |
|---|---|---|---|---|---|---|
| | Additional control | | Size proxy | | Binary for foreign empl. | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\text{For}_i$ | 4.8061*** | 17.1676*** | 4.9615*** | 17.4123*** | 2.3797*** | 8.5821 |
| | (0.7183) | (3.6675) | (0.2514) | (2.1041) | (0.0644) | (27.7550) |
| $\ln \text{Size}_i$ | 0.1800*** | 0.5418*** | 0.0267 | 0.1467*** | -0.1108*** | 0.7333 |
| | (0.0569) | (0.1111) | (0.0240) | (0.0301) | (0.0361) | (4.1932) |
| $\text{For}_i * \ln \text{Size}_i$ | | -2.3419*** | | -0.8111*** | | -1.1381 |
| | | (0.7426) | | (0.1350) | | (5.5084) |
| Observations | 1,057 | 1,057 | 1,039 | 1,039 | 1,057 | 1,057 |
| Sector FE | yes | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.5436* | 3.4335 ; -0.6481 | 0.7363* | -5.5239*** ; 9.2375*** | 0.8044** | 8.1486*** ; -4.3026* |
| | (0.2899) | (2.5808) ; (2.2213) | (0.3757) | (1.6014) ; (1.8712) | (0.3210) | (2.8833) ; (2.5043) |
| 1st stage F stat. | 11.39 | 11.17 ; 10.27 | 5.77 | 5.91 ; 6.27 | 6.83 | 6.75 ; 10.97 |

Note: IV-Probit estimation results. The dependent variable is a binary equal to one if the firm exports and zero otherwise. Controls include the (log) age of the firm, and a binary variable equal to one for mono-product firm and zero otherwise. In columns (1) and (2), we also control for the share of foreign ownership of the firm. In columns (3) and (4), the size proxy, denoted $\ln \text{Size}_i$, is the logarithm of the firm's assets. In columns (5) and (6), we define $\text{For}_i$ as a binary variable equal to one if the firm employs at least one skilled foreign worker, and zero otherwise. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.7** – Validation of Proposition 1 – Alternative Model Specifications

| | Indirect/Direct Export dummy | | | | | |
|---|---|---|---|---|---|---|
| | Additional control | | Size proxy | | Binary for foreign empl. | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\text{For}_i$ | -0.0357 | 4.4856*** | 0.7002 | 4.5797*** | 0.2914 | 2.4094*** |
| | (1.5571) | (0.7396) | (1.0980) | (0.3201) | (0.9692) | (0.0697) |
| $\ln \text{Size}_i$ | -0.0245 | 0.2043*** | -0.0402 | 0.0518 | -0.0271 | -0.0978** |
| | (0.0702) | (0.0687) | (0.0368) | (0.0406) | (0.0770) | (0.0487) |
| Observations | 837 | 899 | 827 | 885 | 837 | 899 |
| Sector FE | yes | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.5284* | 0.5445* | 0.7009** | 0.7271** | 0.7198*** | 0.7761*** |
| | (0.2788) | (0.2881) | (0.3496) | (0.3665) | (0.2528) | (0.2931) |
| 1st stage F stat. | 9.55 | 9.15 | 4.79 | 4.66 | 6.42 | 6.20 |

Note: IV-Probit estimation results. The dependent variable is a binary equal to one if the firm exports indirectly and zero otherwise in odd-numbered columns, and a binary equal to one if the firm exports directly and zero otherwise in even-numbered columns. Controls include the (log) age of the firm, and a binary variable equal to one for mono-product firm and zero otherwise. In columns (1) and (2), we also control for the share of foreign ownership of the firm. In columns (3) and (4), the size proxy, denoted $\ln \text{Size}_i$, is the logarithm of the firm's assets. In columns (5) and (6), we define $\text{For}_i$ as a binary variable equal to one if the firm employs at least one skilled foreign worker, and zero otherwise. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.8** – Validation of Proposition 2 – Alternative Model Specifications

| | Export dummy | | | | | |
|---|---|---|---|---|---|---|
| | Additional control | | Size proxy | | Binary for foreign empl. | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\text{For}_i$ | 3.6693*** | 3.4149** | 3.2604** | 3.2536** | 2.3489*** | 2.1923*** |
| | (1.0031) | (1.6230) | (1.3125) | (1.5453) | (0.2569) | (0.5123) |
| $\ln \text{Size}_i$ | 0.1626*** | 0.1459** | 0.0973 | 0.1076 | -0.0424 | -0.0252 |
| | (0.0564) | (0.0698) | (0.0609) | (0.1013) | (0.0562) | (0.0806) |
| Observations | 623 | 485 | 616 | 481 | 623 | 485 |
| Sector FE | yes | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.5432* | 0.4756** | 0.6673** | 0.5736** | 0.5886*** | 0.6512*** |
| | (0.2800) | (0.2328) | (0.3204) | (0.2488) | (0.1367) | (0.1751) |
| 1st stage F stat. | 5.82 | 5.48 | 3.30 | 2.68 | 4.26 | 3.94 |

Note: IV-Probit estimation results. The dependent variable is a binary equal to one if the firm exports more directly than indirectly in odd-numbered columns, and a binary equal to one if the firm exports directly and zero if it exports indirectly in even-numbered columns which excludes firms using both export modes. Controls include the (log) age of the firm, and a binary variable equal to one for mono-product firm and zero otherwise. In columns (1) and (2), we also control for the share of foreign ownership of the firm. In columns (3) and (4), the size proxy, denoted $\ln \text{Size}_i$, is the logarithm of the firm's assets. In columns (5) and (6), we define $\text{For}_i$ as a binary variable equal to one if the firm employs at least one skilled foreign worker, and zero otherwise. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.9** – Validation of Proposition 3 – Alternative Model Specifications

| | Export dummy | | | | | |
|---|---|---|---|---|---|---|
| | Manufacturers only | | Excl. state-owned firms | | Excl. top 5% MNEs | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\text{For}_i$ | 4.9573*** | 17.9309*** | 4.7737*** | 18.0299*** | 4.9708*** | 18.5451*** |
| | (0.2527) | (6.0169) | (0.2609) | (2.7104) | (0.2537) | (2.6790) |
| $\ln \text{Size}_i$ | 0.1266** | 0.5055** | 0.1267** | 0.5712*** | 0.1295** | 0.5632*** |
| | (0.0592) | (0.2179) | (0.0594) | (0.0889) | (0.0594) | (0.0867) |
| $\text{For}_i * \ln \text{Size}_i$ | | -2.4266* | | -2.5400*** | | -2.5979*** |
| | | (1.2634) | | (0.5403) | | (0.5432) |
| Observations | 1,050 | 1,050 | 987 | 987 | 1,057 | 1,057 |
| Sector FE | yes | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.7274** | 5.7028*** ; -2.3798 | 0.7109** | 5.3157** ; -2.1911 | 0.7241** | 5.4726** ; -2.2368 |
| | (0.3640) | (2.2101) ; (2.0092) | (0.3536) | (2.3106) ; (2.0649) | (0.3610) | (2.2362) ; (2.0164) |
| 1st stage F stat. | 6.09 | 6.16 ; 5.84 | 4.91 | 4.96 ; 4.78 | 5.99 | 6.05 ; 5.74 |

| | MNEs only | | Excl. if using both modes | | Excl. only exporters | |
|---|---|---|---|---|---|---|
| | (7) | (8) | (9) | (10) | (11) | (12) |
| $\text{For}_i$ | 4.2816*** | 16.2638*** | 4.9482*** | 18.4730*** | 5.1875*** | 18.5860*** |
| | (0.4276) | (2.7935) | (0.3134) | (2.7426) | (0.3035) | (2.5976) |
| $\ln \text{Size}_i$ | 0.1397*** | 0.5893*** | 0.1389* | 0.5758*** | 0.0665 | 0.4307*** |
| | (0.0506) | (0.1087) | (0.0760) | (0.0874) | (0.0487) | (0.0841) |
| $\text{For}_i * \ln \text{Size}_i$ | | -2.2485*** | | -2.6112*** | | -2.5336*** |
| | | (0.5427) | | (0.5494) | | (0.4930) |
| Observations | 668 | 668 | 990 | 990 | 758 | 758 |
| Sector FE | yes | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.5464* | 3.5439 ; -1.1368 | 0.7469** | 6.0276*** ; -2.5921 | 0.3860*** | 4.3063*** ; -2.1099* |
| | (0.2891) | (2.7118) ; (2.3081) | (0.3803) | (2.2079) ; (2.0281) | (0.0903) | (1.6065) ; (1.1910) |
| 1st stage F stat. | 3.11 | 3.09 ; 2.69 | 5.70 | 5.80 ; 5.57 | 5.14 | 5.08 ; 4.99 |

Note: IV-Probit estimation results. The dependent variable is a binary equal to one if the firm exports and zero otherwise. Controls include the (log) age of the firm, and a binary variable equal to one for mono-product firm and zero otherwise. In columns (1) and (2), we exclude non-manufacturing firms. In columns (3) and (4), we exclude state-owned firms. In columns (5) and (6), we exclude the top 5% of firms in terms of foreign ownership. In columns (7) and (8), we keep multinational firms (MNEs) only. In columns (9) and (10), we exclude firms using both export modes. In columns (11) and (12), we exclude exporting firms that do not serve their domestic market. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.10** – Validation of Proposition 1 – Alternative Samples

| | Indirect/Direct Export dummy | | | | | |
|---|---|---|---|---|---|---|
| | Manufacturers only | | Excl. state-owned firms | | Excl. top 5% MNEs | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $For_i$ | 0.4121 | 4.6252*** | 0.3867 | 4.4525*** | 0.4121 | 4.6433*** |
| | (1.1457) | (0.2751) | (1.1994) | (0.3337) | (1.1457) | (0.2730) |
| $\ln Size_i$ | -0.0050 | 0.1455** | -0.0501 | 0.1498** | -0.0050 | 0.1473** |
| | (0.0584) | (0.0649) | (0.0615) | (0.0713) | (0.0584) | (0.0649) |
| Observations | 837 | 892 | 791 | 845 | 837 | 899 |
| Sector FE | yes | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.6910** | 0.7195** | 0.6804** | 0.7031** | 0.6910** | 0.7159** |
| | (0.3358) | (0.3553) | (0.3303) | (0.3454) | (0.3358) | (0.3521) |
| 1st stage F stat. | 5.03 | 4.93 | 4.33 | 4.11 | 5.03 | 4.87 |

| | MNEs only | | Excl. if using both modes | | Excl. only exporters | |
|---|---|---|---|---|---|---|
| | (7) | (8) | (9) | (10) | (11) | (12) |
| $For_i$ | -0.4128 | 4.0940*** | -2.2962 | 4.5708*** | 1.8406 | 4.9408*** |
| | (1.8768) | (0.5237) | (2.9360) | (0.3618) | (1.9195) | (0.2773) |
| $\ln Size_i$ | -0.1217 | 0.1800*** | -0.0872 | 0.1568** | 0.0063 | 0.0900 |
| | (0.0794) | (0.0643) | (0.0759) | (0.0785) | (0.0821) | (0.0595) |
| Observations | 544 | 583 | 573 | 832 | 535 | 600 |
| Sector FE | yes | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.5356* | 0.5497* | 0.5963** | 0.7433** | 0.3228*** | 0.3745*** |
| | (0.2769) | (0.2868) | (0.2647) | (0.3747) | (0.0509) | (0.0686) |
| 1st stage F stat. | 2.91 | 2.77 | 3.83 | 4.59 | 4.18 | 4.08 |

Note: IV-Probit estimation results. The dependent variable is a binary equal to one if the firm exports indirectly and zero otherwise in odd-numbered columns, and a binary equal to one if the firm exports directly and zero otherwise in even-numbered columns. Controls include the (log) age of the firm, and a binary variable equal to one for mono-product firm and zero otherwise. In columns (1) and (2), we exclude non-manufacturing firms. In columns (3) and (4), we exclude state-owned firms. In columns (5) and (6), we exclude the top 5% of firms in terms of foreign ownership. In columns (7) and (8), we keep multinational firms (MNEs) only. In columns (9) and (10), we exclude firms using both export modes. In columns (11) and (12), we exclude exporting firms that do not serve their domestic market. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.11** – Validation of Proposition 2 – Alternative Samples

| | Indirect/Direct Export dummy | | | | | |
|---|---|---|---|---|---|---|
| | Manufacturers only | | Excl. state-owned firms | | Excl. top 5% MNEs | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\text{For}_i$ | 3.4393*** | 3.2174** | 3.3866*** | 3.1194** | 3.4393*** | 3.2174** |
| | (0.9634) | (1.4453) | (0.9631) | (1.5904) | (0.9634) | (1.4453) |
| $\ln \text{Size}_i$ | 0.1499*** | 0.1328* | 0.1601*** | 0.1541* | 0.1499*** | 0.1328* |
| | (0.0566) | (0.0700) | (0.0614) | (0.0823) | (0.0566) | (0.0700) |
| Observations | 623 | 485 | 606 | 475 | 623 | 485 |
| Sector FE | yes | yes | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.6629** | 0.5951** | 0.6610** | 0.5936** | 0.6629** | 0.5951** |
| | (0.3033) | (0.2543) | (0.3037) | (0.2547) | (0.3033) | (0.2543) |
| 1st stage F stat. | 3.58 | 2.96 | 3.27 | 2.68 | 3.58 | 2.96 |

| | MNEs only | | Excl. only exporters | |
|---|---|---|---|---|
| | (7) | (8) | (9) | (10) |
| $\text{For}_i$ | 3.6522*** | 3.3468** | 3.4089* | 2.3064 |
| | (0.7770) | (1.5830) | (1.8983) | (4.2597) |
| $\ln \text{Size}_i$ | 0.1935** | 0.2127* | 0.1051 | 0.1344 |
| | (0.0765) | (0.1184) | (0.0909) | (0.1273) |
| Observations | 455 | 313 | 329 | 261 |
| Sector FE | yes | yes | yes | yes |
| Province FE | yes | yes | yes | yes |
| Controls | yes | yes | yes | yes |
| Estimator | IV-Probit | IV-Probit | IV-Probit | IV-Probit |
| 1st stage coefficients | 0.5441* | 0.4552** | 0.3366*** | 0.3707*** |
| | (0.2782) | (0.2156) | (0.0569) | (0.0445) |
| 1st stage F stat. | 2.26 | 1.31 | 2.30 | 2.25 |

Note: IV-Probit estimation results. The dependent variable is a binary equal to one if the firm exports more directly than indirectly in odd-numbered columns, and a binary equal to one if the firm exports directly and zero if it exports indirectly in even-numbered columns which excludes firms using both export modes. Controls include the (log) age of the firm, and a binary variable equal to one for mono-product firm and zero otherwise. In columns (1) and (2), we exclude non-manufacturing firms. In columns (3) and (4), we exclude state-owned firms. In columns (5) and (6), we exclude the top 5% of firms in terms of foreign ownership. In columns (7) and (8), we keep multinational firms (MNEs) only. In columns (9) and (10), we exclude exporting firms that do not serve their domestic market. Regressions include a binary variable for an observation's survey year source, taking the value zero for 2009 and one for 2010. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.12** – Validation of Proposition 3 – Alternative Samples

### 3.A.5 Propensity Score Matching

To further validate the main results, we employ propensity score matching to estimate the impact of skilled foreign employment on export outcomes. This approach serves as an additional analysis, considering the limitations of our primary analysis that exploits unskilled foreign workers as an instrumental variable. By calculating the probability that a firm is treated based on a set of observable characteristics, we leverage a doubly robust estimator to calculate the average treatment effect on the treated (ATT) for skilled foreign employment on export outcomes.

$$\hat{T}_i = \text{Prob}(T_i = 1|C_i)$$

where $T_i$ denotes whether firm $i$ has hired at least one skilled foreign worker (1 if treated, 0 otherwise), through a probit regression of the form $T_i = \beta_0 + \Gamma' C_i + \epsilon_i$. The control vector $\text{C}_i$ includes observable firm characteristics such as how productive the firm is, either proxied by the logarithm of size by number of employees, or using the survey's own total factor productivity (TFP) measure, age, age squared, a dummy for mono-product firms, a dummy for manufacturing firms, and a dummy for firms located in the HCMC or Hanoi regions.

We use the predicted values of the treatment probability to calculate the inverse probability weighted score as follows (Jonsson Funk et al., 2011):

$$W_i = \frac{T_i}{\hat{T}_i} + \frac{1 - T_i}{1 - \hat{T}_i}$$

Upon estimating the propensity scores for each firm, we match firms employing skilled foreign workers with those that do not, ensuring similarity in observable characteristics. This matching technique helps isolate the effect of skilled foreign employment on export outcomes. The estimation and prediction of export probability for treated and untreated firms, denoted as $X_i(T_i = 0)$ and $X_i(T_i = 1)$ respectively, are performed by weighing these probabilities with $W_i$. This step allows the computation of doubly robust estimates and the ATT, aligning with the methodology proposed by Lunceford and Davidian (2004). The results of the first stage probit estimation are reported in Table A.13. Underlying the propensity score matching is the assumption that the treatment assignment is ignorable conditional on the observed covariates. Also referred to as the positivity, or common support, assumption, this requires that the probability of treatment is non-zero for all units in the sample, and that the treatment and control groups have overlapping distributions of the propensity score. The overlap of the propensity score distributions is depicted in Figure A.2, which shows that the propensity scores for treated and untreated firms are well-aligned. The results of the propensity score matching are reported in Table A.14. The results are consistent with the main analysis, showing that the impact of skilled foreign employment on export outcomes is positive and significant for exporting, in general, and for direct exporting, in particular, both for the full sample and for small and large firms. Nevertheless, the impact is not significant for indirect exporting.

| | $T_i$ |
|---|---|
| | (1) |
| $\text{Age}_i$ | -0.0269** |
| | (0.0106) |
| $\text{Age}_i^2$ | 0.0001 |
| | (0.0002) |
| $\text{Mono}_i$ | 0.2004** |
| | (0.0868) |
| $\ln \text{Size}_i$ (TFP) | 0.0464** |
| | (0.0227) |
| Hanoi & $\text{HCMC}_i$ | 0.0613 |
| | (0.0851) |
| $\text{Manufacturing}_i$ | 0.2940 |
| | (0.2049) |
| Observations | 1,113 |

Note: Probit estimation results. The dependent variable is the treatment indicator $T_i$, which equals 1 if the firm hires at least one skilled foreign worker. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.13** – Propensity Score Estimates: Impact of Observable Characteristics on the Probability of a Firm Employing Skilled Foreign Workers.

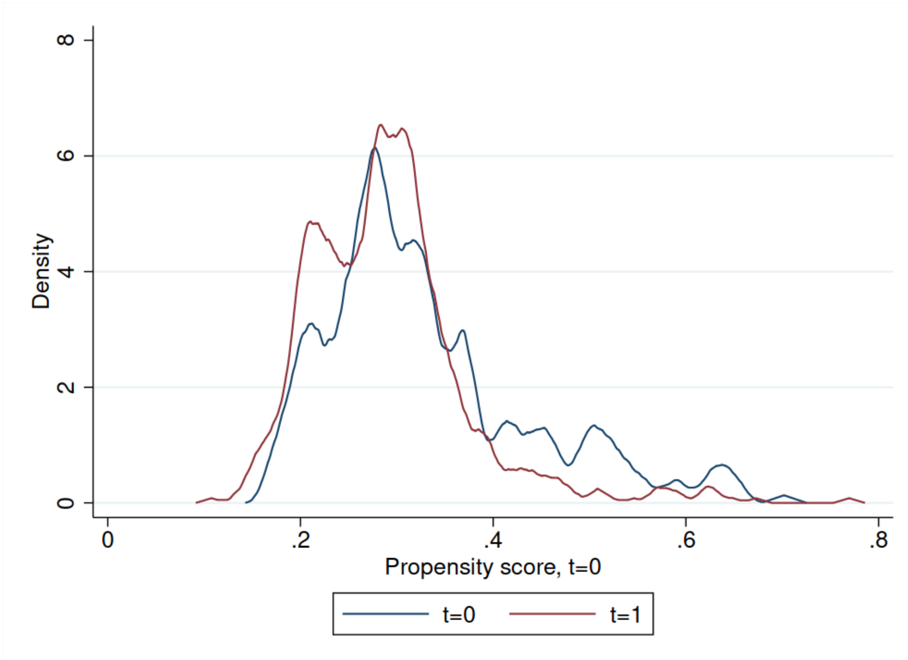



**Figure A.2** – Overlap of the Propensity Score Distributions.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Outcome | **Export** | | **Indirect export** | | **Direct export** | |
| Size proxy | TFP | nr. empl. | TFP | nr. empl. | TFP | nr. empl. |
| | | | *All firms* | | | |
| ATT | 0.172*** | 0.145*** | 0.006 | 0.002 | **0.154*** | 0.121*** |
| S.E. | (0.032) | (0.030) | (0.022) | (0.024) | (0.033) | (0.031) |
| N | [1,113] | [1,113] | [ 1,064] | [1,103] | [1,064] | [1,103] |
| | | | *Small firms* | | | |
| ATT | 0.206*** | 0.188*** | 0.044 | 0.044 | 0.183*** | 0.154*** |
| S.E. | (0.043) | (0.040) | (0.030) | (0.027) | (0.045) | (0.044) |
| N | [555] | [576] | [527] | [552] | [527] | [552] |
| | | | *Large firms* | | | |
| ATT | 0.137*** | 0.096** | -0.043 | -0.040 | 0.132*** | 0.093** |
| S.E. | (0.047) | (0.040) | (0.035) | (0.039) | (0.048) | (0.043) |
| N | [555] | [576] | [534] | [551] | [534] | [551] |

Note: Probit estimation results. The dependent variable is the treatment indicator $T_i$, which equals 1 if the firm hires at least one skilled foreign worker. ***, **, and * denote significance at the 1%, 5%, and 10% level. Errors clustered at the province-sector level are reported in parentheses.

**Table A.14** – Propensity Score Estimates: Impact of Observable Characteristics on the Probability of a Firm Employing Skilled Foreign Workers.

# Concluding Remarks

This dissertation explored how firm heterogeneity can shape not only market structures but also political processes and international trade behaviors. The synthesis of findings across the three chapters highlights the interplay between firm productivity, political influence, and economic outcomes.

### 3.1.6 Synthesis of Findings

**Chapter 1.** The first chapter established a theoretical framework that integrates strategic lobbying by special interest groups (SIGs) into a standard heterogeneous firms model. It established that lobbying by SIGs can significantly influence market concentration and the size distribution of firms through strategic regulatory capture. This influence predominantly disadvantages consumers, especially when a single SIG dominates the lobbying game. However, the presence of multiple lobbies can sometimes lead to a counterbalance, potentially mitigating some of the adverse effects. A key component of this chapter was the establishment of a theoretical model that integrates a common agency "lobbying" game into a standard heterogeneous firms framework, the Melitz model. This model was adapted to explore how SIGs influence the policymaker in order to enact policies that benefit their members, often at the expense of consumer welfare and potentially leading to increased industry-level concentration. Chapter 1 establishes a clear link between SIG activities and market concentration, providing a nuanced understanding of how political economy factors can shape economic outcomes in significant ways. These insights not only deepen our understanding of political economy behaviours that play a role in market dynamics but also underscore the need for comprehensive reforms in lobbying regulations to prevent the disproportionate influence of powerful economic actors on public policy.

**Chapter 2.** The second chapter provided a detailed empirical analysis that focused on the relationship between political contributions and market concentration in the U.S. over the past three decades. This chapter extended the discussion of firm heterogeneity and strategic lobbying to show how these factors concretely affect market structures within the political and economic landscape of the United States. Leveraging comprehensive campaign finance data from the OpenSecrets Campaign Finance Database, the Business Dynamics Statistics (BDS) from the U.S. Census Bureau , and the joint BEA-BLS Industry-Level Productivity Database, among other sources, this study examined the mechanisms through which political contributions have potentially contributed to the rising market concentration observed since the 1990s. This chapter extended the discussion of firm heterogeneity and strategic lobbying to show how these factors concretely affect market structures within the political and economic landscape of the United States. The empirical findings suggest a robust relationship where *relative* increases in political donations are associated with greater employment shares at larger firms, implying a shift towards more concentrated industry structures.

A pivotal aspect of this analysis was the categorization of industries based on the correlation between Total Factor Productivity (TFP) and market concentration. The results pointed to a significant divergence: In industries where TFP and concentration were not positively correlated, political contributions favored larger firms, supporting the rent-seeking hypothesis that argues contributions are used to influence regulatory environments to erect barriers that protect incumbent large firms at the expense of smaller competitors. Conversely, in industries where TFP positively correlated with concentration, the link between contributions and market outcomes was less pronounced, suggesting that in these sectors, market concentration might still be driven by factors aligned with competitive merit and innovation ("Good Concentration") rather than purely by political maneuvering.

The chapter employed a shift-share instrumental variable identification strategy, using ideologically motivated political contributions as instruments to isolate the exogenous variation in political donations related to industry-specific characteristics. This methodological choice was crucial in establishing the causal interpretation of the results, allowing for a more robust analysis of the relationship between political contributions and market concentration.

The insights from this chapter bear significant implications for policy. They suggest that without stringent controls and transparency in political funding, especially concerning corporate contributions, efforts to promote competitive markets and curb excessive concentration might be undermined. These findings advocate for a reevaluation of current policies and potentially the introduction of more rigorous reforms to address the influence of big money in politics.

**Chapter 3.** The third chapter shifted the focus to the international stage, examining the impact of foreign workers on export behaviors in Viet Nam. This chapter explored how the presence of skilled foreign workers in firms can influence their export activities, shedding light on the role of human capital in shaping international trade patterns. This study developed a theoretical model that integrates foreign workers into a standard heterogeneous firms framework to explore how the presence of skilled foreign workers can alleviate productivity constraints and enhance firms' abilities to access foreign markets.

Following the theoretical analysis, the empirical section of this chapter leveraged firm-level data from the UNIDO's Viet Nam Industry Investor Survey to examine the relationship between foreign workers and export behaviors, including direct exports, indirect exports, and export intensity, among Vietnamese firms. The results indicated that skilled foreign workers significantly enhance firms' abilities to engage in direct exports, suggesting that the presence of foreign workers can enrich the firm's strategic options and economic outcomes. Furthermore, given the role of export activities in fostering economic growth in developing countries, these findings underscore the importance of fostering an environment that attracts skilled foreign workers to enhance firms' export capabilities and contribute to broader economic development.

The chapter's findings have significant implications for policy, particularly in the context of developing countries seeking to enhance their export competitiveness. By highlighting the positive relationship between skilled foreign workers and export activities, this study suggests that policies aimed at attracting and retaining skilled foreign workers can play a crucial role in fostering economic growth and development.

### 3.1.7 Conclusion

This dissertation provides a comprehensive understanding that can inform both policy and future research, aiming to foster a more equitable and efficient economic environment. The synthesis of findings across the three chapters underscores the importance of firm heterogeneity in shaping market structures, political processes, and international trade behaviors. By studying the interplay between these factors, this dissertation contributes to a more nuanced understanding of the role of firms in the broader economic landscape. The findings highlight the need for comprehensive reforms in lobbying regulations to prevent the disproportionate influence of powerful economic actors on public policy. They also underscore the importance of fostering an environment that attracts skilled foreign workers to enhance firms' export capabilities and contribute to broader economic development.

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