

Essays in Development Economics, International Trade and Industrial Organisation

*This thesis submitted to the University of Dublin, Trinity College
for the degree of Doctor of Philosophy in Economics*

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Declaration

I declare that this thesis has not been submitted as an exercise for a degree at this or any other university and it is entirely my own work.

Chapter 4 of this thesis is co-authored with Stuart Baumann from the University of Edinburgh. Details are given in the acknowledgements.

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Summary

This dissertation examines questions in the areas of development economics, international trade and industrial organisation in both empirical and theoretical settings. It consists of an introduction, two empirical research chapters, one theoretical research chapter and a conclusion. Chapter one, the introduction, provides an overview of the research contained in this thesis.

Chapter two examines whether United States imports can be affected by the provision of information about what foreign goods might be produced with child and forced labor. I investigate this using three different measures of information revelation: inclusion on the U.S. government's list of goods produced with child or forced labor, a media coverage index of child and forced labor violations and an index composed from reports of the International Labor Organisation (ILO). This chapter finds no evidence that information provision decreased United States imports of these goods.

The third chapter is also in the field of development economics and international trade. It investigates whether foreign competition affects the reallocation of unpaid and family workers from household firms to working outside of the family firm. I examine this using a rich panel dataset of Vietnamese manufacturing enterprises that went through trade liberalisation. The finding is that import competition leads to the switching of family and unpaid employees from working at the household firm to working externally. The response to increased foreign competition is greater for less financially stable firms, and for households with less income generation jobs per family. This finding is consistent with income diversification on the part of households who own firms threatened by import competition.

Chapter four is a work in the theory of consumer search. This chapter is motivated by a finding in a marketing literature that consumers generally expect high quality sellers to post higher prices. This is modelled in a consumer search market with vertically differentiated firms, heterogeneous consumers and endogenous consumer market entry. When the quality is unknown to consumers, high and low quality firms make equal sales and profit. However, when quality is known, search frictions induce an unravelling mechanism that leads to a unique refined equilibrium where only low quality firms are visited by consumers. Low quality firms dominate the market and high quality firms make no sales or profit.

Chapter five provides concluding remarks and some policy implications of the research.

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Chapter 1

Introduction

The chapters presented in this dissertation are in the areas of development economics, international trade and industrial organisation. The second chapter of this dissertation finds that information provision about child and forced labor in the production of goods does not diminish exports of these goods. Subsequently, the third chapter focuses on the case of Vietnam to find that an increase in imports competition leads to the reallocation of household and unpaid firm members. Finally, the fourth chapter finds that in consumer search market where consumers know the quality but not the price of the goods offered, high quality firms make no sales or profit. While these research topics are diverse, there are some common elements. The second and third chapters both consider international trade and how consumers and firms react to it. The second and fourth chapters are linked by both examining the effects of information provision on markets. The fourth chapter is related to the third chapter in a focus on the behaviour of firms.

1.1 The trade impacts of the naming and shaming of forced and child labor

This chapter examines whether the information about what foreign goods might be produced with child and forced labor affects its imports to a developed country. This question is motivated by events such as Rana Plaza factory collapse in Bangladesh in 2013, one of the deadliest industrial accidents in history. This factory produced apparel for 29 brands including the brand such as Benetton, Joe Fresh, Texman and Primark. This event attracted a large amount of media attention calling companies, government, and consumers to action. Several companies that sourced garments from the factory responded by signing an agreement on worker safety and providing financial support to the victims. Many consumers said they would stop buying goods from the involved brands (The Guardian, 2014a; Social Europe, 2014). This seems to be in line with a recent survey by the Walk Free Foundation (2015). This survey showed support for consumer action with two thirds of respondents in the United States would switch to other products if they found out that the good is produced under slavery conditions,^{1.1} and 14% answered that they would continue buying

^{1.1}Slavery is defined as “*the status or condition of a person over whom any or all of the powers attaching to the right of ownership are exercised*” (United Nations, 1926).

the product. This is just one of many examples of poor working conditions in developing countries. The information about poor labor conditions in the production of other goods is widely available. The U.S. government created a list of goods produced with child or forced labor (TVPRA list) to motivate governments, firms, and consumers to combat the problem.

I use this list to answer does the information provision about child and forced labor in the production of foreign goods affects imports of these goods to the United States. Three information measures were used with the first one being the inclusion of a country-good on the TVPRA list. The second variable is a media coverage index that measures the amount of information about child and forced labor violation in a production of a good within a particular country over time. The last information variable is an index created from the reports of the ILO which measures child and forced labor violation in a particular country over time. All these measures were matched with the U.S. imports data. The chapter finds no evidence that information provision decreased United States imports of these goods. No evidence is found when the analysis is limited to industries that are closer to the point of consumption or when the analysis is disaggregated by sector.

This chapter contributes to several bodies of the literature. Whilst the public response to labor rights violations have been examined previously, most of the existing literature examines boycotts and labelling experiments. This chapter provides empirical evidence that systematic listing of goods produced with child and forced labor doesn't diminish imports of these goods. This chapter also relates to the literature examining the link between labor standards and export performance. The main contribution to this literature is in using new measures of labor violations which are the TVPRA list and media index. This chapter is also related to a literature examining the effect of shifts in consumer sentiment on aggregate trade. While papers in this literature found that consumer sentiment can influence trade, these papers focused on the political disagreements. This chapter is the first to examine potential aggregate effects emerging from responses to information provision about child and forced labor.

1.2 The effect of foreign competition on family and network labor allocation

Chapter three investigates the impact of foreign competition on the behaviour of household firms in Vietnam. This chapter is motivated by ILO statistics which suggested that over half of the 1.45 billion workers in the developing countries are either self-employed or are unpaid family workers in a family firm (International Labour Organization, 2014). This type of employment is widespread in Vietnam, where the majority of workers in the informal sector are either self-employed or family workers. Given this large share of family employment, it was important to examine whether foreign competition affects the reallocation of unpaid and family workers from household businesses to working outside of the household firm. This effect can go both ways - on the one hand, uncertainty regarding the future of the family firm can lead to family labor staying at the firm in order to help it survive. On the other hand, they might decide to leave the firm in order to diversify uncertain household income caused by increasing foreign competition.

In order to examine this question, a panel of Vietnamese Small and Medium Enterprise Survey over the period 2005 and 2013 was used. The analysis relies on a sample of household manufacturing

enterprises that went through trade liberalisation. This chapter finds that import competition leads to the switching of family and unpaid employees from working at the household firm to working outside of the firm. This response to heightening foreign competition is greater for less financially stable firms, and for the households with a lesser number of income generating jobs. This finding is consistent with the income diversification mechanism.

The results of this chapter are consistent with the recent literature examining the effects of trade liberalisation on firm dynamics and labor allocation. In particular, the results are in line with the Vietnamese findings of McCaig and Pavcnik (2014, 2018). This chapter contributes to the literature by examining the mechanisms through which this reallocation at Vietnamese occurs as well as links the results of these two papers.

1.3 It's good to be bad: a model of low quality dominance in a consumer search market

Chapter four is largely motivated by the marketing literature which found that consumers generally expect high quality firms to display high prices. This is important in markets where consumers know the quality levels, but not the prices for the item sought, an information state frequently occurring in consumer search markets. If consumers expect high quality firms to price at a high level, then the possibility emerges for firms to communicate that they are lower quality in order to increase the number of consumers that visit them. This can be seen in the market with some firms going to lengths to communicate that they are low quality in their marketing campaigns. A prominent example is Irish budget airline Ryanair which has been proactive in building a low quality reputation as part of their “no frills” strategy. Ryanair CEO Michael O’Leary has stated to the media that *“Anyone who thinks Ryanair flights are some sort of bastion of sanctity where you can contemplate your navel is wrong. We already bombard you with as many in-flight announcements and trolleys as we can. Anyone who looks like sleeping, we wake them up to sell them things”* (The Telegraph, 2016).^{1,2} Other examples are discount stores that specialize in selling “factory seconds” such as Australia’s “Reject Shop”. In the advertisements, these stores often use phrases (although ambiguous) suggestive of low quality (i.e. “like new”, “discontinued”, “second-hand” or “refurbished”).

We model this effect in a consumer search market. We present a model with a high quality firm and a low quality firm, where consumers have heterogeneous marginal utility from quality and can select the firm they would like to visit before they enter the market. Considering a putative equilibrium where high taste consumers go to the high quality firm, and low taste consumers go to the low quality firm, the high quality firm will price to make one of the consumers approaching it indifferent between buying and searching at the low quality firm. The diamond paradox applies to this marginal consumer, and the consumer makes no surplus. When a consumer can anticipate however that when he arrives at a high quality firm, he will be this marginal consumer, then that consumer would be better off going to the low quality firm ex-ante. This will result in fewer and higher taste consumers visiting the high quality firm, which will result in this firm increasing its prices to make a higher taste consumer (new marginal consumer) indifferent to buying and

^{1,2}This has gone so far as the CEO of Ryanair publicly announcing that extra charges for toilet use were under consideration from the airline (The Economist, 2013). These charges were never actually implemented.

searching at the low quality firm. This new marginal consumer will again be better off going to the low quality firm ex-ante. Through this mechanism, we get full information unraveling result, where the sole refined equilibrium is one where all consumers go to a low quality firm, and no consumers will visit a high quality firm.

This chapter contributes to the consumer search literature in a few ways. Firstly, it provides a rationale for why firms may communicate they are low quality. Secondly, the chapter's model illustrates the case where more information in a market may deteriorate the equilibrium surplus. In this way, the chapter presents an interesting contrast with Akerlof (1970).

Chapter 2

The trade impacts of the naming and shaming of forced and child labor*

2.1 Introduction

Events like the revelations of child and forced labor in Uzbekistan's cotton fields in 2007 and forced labor in the Thai prawn fishing industry in 2014 as well as the Rana Plaza factory collapse in 2013 have brought the issue of labor conditions to the forefront of public debate. Despite numerous international efforts aimed at the prohibition of these labor practices, child and forced labor remain challenges today. The International Labor Organization (2012) (hereafter ILO) estimates that there are 20.9 million forced workers in the world with 68% of these engaged in economic activities.^{2.1} The ILO and the World Bank estimate that 168 million children between the ages of 5 and 17 are engaged in child labor (International Labour Office, International Programme on the Elimination of Child Labour, 2012). Given the scale of the problem and its expansive spread around the world, a recent literature has emerged examining what proactive steps could be taken to mitigate child and forced labor. This chapter fills a gap in this literature by examining the previously unexplored effect of information revelation regarding the use of child and forced labor on international trade.

There are many historical examples of consumers reacting to distasteful information regarding good production by ceasing to buy the good. This can arise informally through consumers deciding to stop buying certain products. There is a long history of such consumer action in the United States

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^{2.1}These activities include agriculture, construction, manufacturing or domestic work. The remaining 32% of forced workers are involved into forced sexual labor (22%) and government imposed forms of forced labor (10%).

dating back to the “American Free Produce Association” formed in 1838 (Nuernberger, 1942). This group opposed slavery in the Southern states and took action by advocating for consumers to only buy goods produced without the use of slaves. Consumer boycotts of sweatshops in the 1990’s are another example of consumers refraining from buying goods due to repugnance of the means of production. More recently Kailash Satyarthi, a 2014 Nobel Peace Prize laureate, advocated for consumers to boycott goods produced using child labor (Gowen and Lakshmi, 2014).^{2.2} There have also been cases of firms boycotting goods from certain countries; such as the world’s largest retailer Walmart launching a boycott of Uzbekistan’s cotton in 2008 (Birchall, 2008).

There are three broad types of interventions aimed at reducing child and forced labor (Basu, 1999).^{2.3} The first is intranational, which is a set of government laws, regulations or non-governmental programmes aimed at deterring exploitative labor practices inside a country, for instance through providing access to education and nutrition (World Food Programme, 2003; The SOLD Project, 2007; Bangalore Rural Educational and Development Society, 2013). The second, supranational, is the collaboration of governments and international organisations with agreements aimed at the elimination of these labor practices globally. The work of the ILO and its underlying labor conventions is a good example of this (International Labour Organization, 1930, 1957, 1973, 1999). The third is extra-national, which consists of a set of efforts in one country aimed at influencing child and forced labor levels in a foreign country. One of the extra-national methods aimed at eliminating forced and child labor is to name and shame countries that are known to use child and forced labor in the production of export goods. The rationale for this strategy is to inform the importing governments, firms and consumers of the conditions under which various goods are produced, so that they can decide whether or not to purchase the goods. If importing firms and consumers choose to avoid buying the product, then the market share of exploitative firms and countries is lost and there is a clear incentive for them to cease their use of these exploitative labor practices (Freeman, 1994; Basu, 1999).

The most prominent example of this strategy currently in use is the “List of Goods Produced by Child Labor or Forced Labor” published by the U.S. Department of Labor (DOL). This list was established as part of the “Trafficking Victims Protection Reauthorization Act” (TVPRA), which was signed into law in 2006 with the aim of facilitating efforts to monitor and combat child labor and forced labor in the production of goods in foreign countries (Federal Register, 2006). This list (henceforth referred to as the TVPRA list) has the intended purpose of raising public awareness about forced and child labor practices around the world and motivate governments, companies and civil society to combat the problem (United States Department of Labor, 2014). This list is conceived as an information campaign and inclusion or removal from the list does not depend on import volume. Indeed the DOL states that it “... did not distinguish between goods produced for domestic consumption and for export, due to data limitations and because this was not part of the mandate of the TVPRA” (United States Department of Labor, 2014).

This chapter uses three measures to estimate the trade impacts of providing information to consumers on what goods may be produced with child and forced labor. The first measure is a dummy indicating inclusion on the aforementioned TVPRA list itself. The second measure is a media index that was compiled from a diverse range of American newspapers covering around 21% of all

^{2.2}Specifically Kailash Satyarthi advocated for boycotts of Indian carpets produced with child labor.

^{2.3}Although the paper of Basu (1999) discussed the interventions in the context of child labor, these could also be applicable to forced labor case.

daily newspaper circulation in the U.S. The third measure is an index compiled from reports on child and forced labor by the ILO covering a particular country in a certain year. I use data from Comtrade UN Statistics Division (2018) disaggregated by country and by 139 listed goods that I further aggregate into 103 unique industries. Thus every observation represents imports of a particular good from a particular country from a particular industry in a particular year.^{2.4} I then match the import data with the information measures. I explore the variation in imports into the U.S. in a certain industry from a particular country using fixed effects at the industry-country and time-country levels, and examine whether information revelation of child and forced labor leads to lower imports.

I find no evidence of a negative impact of information revelation on imports. This finding of no evidence is robust even when attention is restricted to industries composed of consumer goods or when the analysis is disaggregated by sector including the agriculture, manufacturing and mining sectors. This leads to the major policy implication that extra-national policies revolving around information provision are unlikely to cause drops in trade, and hence might not provide a large incentive for a foreign government to improve labor practices in their country. This implies that more direct measures may be necessary to incentivise changes.

This chapter contributes to three bodies of literature. The first literature examines how the public reacts to information about labor rights violations in the production of goods (Pruitt and Friedman, 1986; Freeman, 1994; Harrison and Scorse, 2010). Accordingly, Freeman (1994) suggests that consumers care about labor standards and that by providing information about the labor conditions that have gone into production of the good, the producer can give them a choice about which good to buy. He argues that even a small change in consumer behaviour would significantly influence revenue, which would in turn push these companies to improve labor conditions. While this idea of labelling^{2.5} may be appropriate for mitigating consumer guilt^{2.6} it has been criticised on the grounds of not being able to improve production conditions in developing countries (Brown, 2001). The other critique concerns the difficulties with the provision of trustworthy information to consumers on labels and the associated monitoring and maintenance costs (Basu, 1999). This can happen when firms may mislabel goods produced with poor labor conditions in order to benefit from higher market prices from the label (Freeman, 1994; Rodrik, 1996).^{2.7} The effects of labelling are mixed on the empirical side of the literature with some papers finding that only a small portion of consumers are affected by labels (Dickson, 2001; Prasad et al., 2004), while other papers show a positive relationship between social labelling and reduction in child labor for above subsistence-level households (Chakrabarty and Grote, 2009).

^{2.4}Section 2.3 and Appendix 2.B further provide details on the aggregation.

^{2.5}Labelling is one example of information provision which could include child labor free stickers, fair trade stickers etc. on the physical good. Another example of information provision is listing which provides information in a way that does not physically mark the good. In a consumer survey Marymount University, Center for Ethical Concerns (1999), labelling was the preferred way for consumers to receive information (with 56% of consumers preferring this way), and listing was the second most preferred alternative chosen by 33% of responders.

^{2.6}See also Baland and Duprez (2009) who in a theoretical paper argue that in cases where a minority of consumers react to labels warning of child labor use, there will be no impact on child worker wages and hence the overall incidence of child labor. They argued that child workers will substitute into producing child labor labelled goods (to sell to consumers who do not react to labels) while adult workers shift into producing other goods. Thus labelling induces worker changes between industries but not changes in the overall incidence of child labor. Basu, Chau and Grote (2006) examine the effects of social labelling based on four features: child labor employment, consumer information, welfare, and trade linkages by employing a theoretical model. They find that consumers and firms benefit from social labelling. The trade sanctions of non-labelled products discourage trade, but do not affect child labor levels.

^{2.7}There is also related literature on the effects of information shocks on reputation and value of firms (Barber and Darrrough, 1996; Tadelis, 1999; DellaVigna and La Ferrara, 2010; Glazer, Kanninen and Poutvaara, 2010).

The second literature concerns the link between labor standards and the export performance of countries (Brown, 2001; Dehejia and Samy, 2004; Salem and Rozental, 2012). A major issue with labor standards measures which emerges in this literature is endogeneity. One key measure of labor standards used is the ratification of ILO conventions but ratification is often strongly correlated with the level of social, economic and political advancement of a country. Furthermore ILO conventions may not be binding and absence of ratification in a country does not always imply poor labor conditions. In order to overcome this endogeneity issue researchers have used proxies of labor standards such as the number of strikes in a country, the rate of work injuries (Bonnal, 2010) as well as indicators of trade union rights and democracy (Kucera and Sarna, 2006). This literature generally finds no clear evidence that bad labor conditions are associated with worse trade performance. While child and forced labor violations are associated with poor labor standards, the focus of this chapter is quite different. This chapter is interested in examining the informational effect of child and forced labor violations rather being focussed on more classic problems of understanding whether labor standards can affect comparative advantage, improve exports performance etc. Furthermore, the TVPRA list and media indices used in this chapter have not been used in the literature previously.

The third body of the literature related to this chapter examines how shifts in consumer sentiment (broadly defined) can affect aggregate trade flows between countries (Michaels and Zhi, 2010; Fuchs and Klanna, 2013; Clerides, Davis and Michis, 2015). While papers have found that consumer sentiment affects trade, all of these papers have examined sentiment changes that fundamentally emerge from political disagreements between countries. For instance, Michaels and Zhi (2010) established a drop in France-U.S. trade as a result of tensions emerging from the Iraq war while Fuchs and Klanna (2013) presented a gravity model for 159 countries and found that exports to China declined after they were visited by the Dalai Lama. Thus far, no paper has examined potential aggregate effects emerging from responses to information provision about child and forced labor.

The chapter proceeds as follows. Section 2.2 provides more details on the TVPRA list. The dataset is presented section 2.3, while the empirical approach is discussed in section 2.4. Section 2.5 presents the results before section 2.6 concludes.

2.2 The TVPRA list

“The List of Goods Produced by Child Labor or Forced Labor” has been issued by the U.S. Government’s Bureau of International Labor Affairs at the U.S. Department of Labor since 2009 and is submitted to the Senate every year on December 1. In 2013, the TVPRA was amended to require the submission of the list biennially starting from December, 2014 and thus no list was published been in 2013, 2015 or 2017.^{2.8} The report lists country-goods for which it was believed that child and forced labor were used during the production process (for instance Bangladesh is listed for the use of forced labor in the production of garments). The criteria for the selection of information on which the list is based is that: the nature of the information is relevant and no more than 7 years old;^{2.9} the source of the information is pertinent and probative; the information

^{2.8}Thus, in total 6 reports have been published between 2009 and 2017, including 2009, 2010, 2011, 2012, 2014 and 2016. All these reports will be used in the analysis.

^{2.9}Since 2011, the TVPRA restricted this threshold to 5 years.

is corroborated by other sources and that the information shows significant evidence of child and forced labor practices (United States Department of Labor, 2014). The list has the purpose of increasing the awareness of governments, importing firms and consumers of the child and forced labor practices used in the production of goods.^{2.10} The TVPRA list aims to promote efforts to combat child and forced labor issue; it does not block imports to the U.S. if the good appeared on the list. The most recent report was published in 2016.

DOL regularly considers removals of country-goods from the list if there is sufficient evidence that child and forced labor has been eliminated or reduced to a single case. DOL conducts a number of checks before removals, which include *“desk reviews, in-person and telephone interviews with key informants, and when possible, travel to the relevant countries to conduct in-person interviews and site visits”* (United States Department of Labor, 2016). Four country-goods have been removed from the TVPRA list since the list was first published. In 2014, three country-goods were excluded: tobacco from Kazakhstan, charcoal from Namibia and diamonds from Zimbabwe. In 2016 Jordan’s garments was removed from the list.

In 2012, the California State enacted “The California Transparency in Supply Chains Act” (U.S. Department of State, 2010). The law forces retailing and manufacturing companies that are doing business in the state of California and have at least \$100 million in gross annual revenue globally to disclose their efforts for eliminating slavery and human trafficking practices from their supply chains. The act explicitly cites the extent of child and forced labor reported in the TVPRA list as the primary motivation for the reporting requirements. The act does not request that companies undertake any actions if forced labor takes place; however requires companies to disclose this information to its consumers and the general public. These reporting requirements are likely to accentuate the effect of this list as a company must disclose, in a prominent place on their website, the labor conditions in their supply chain. As such the presence of a supplying country-good on the TVPRA’s list is likely to be problematic for a company that has to disclose their relationship with this country.^{2.11}

A number of governments fear that inclusion on the list might have an adverse impact on their exports. The Royal Thai Embassy (2010) rebutted the inclusion of Thailand (for several goods) on the list, stating that the list risks “damaging the country’s reputation, and inflicting harm on the country’s trade”. A vice minister of Vietnam, Pham Minh Huan (2012), responded to the inclusion of Vietnam on the list stating that “it might create negative effects on export of garment and brick from Viet Nam to the U.S. and other markets [sic]”. The Vietnam Chamber of Commerce and Industry (2012) responded by stating that the addition of new goods from Vietnam on the list “will definitely have an adverse impact on the product sales in the United States and over the world [sic]”. The Malaysian government allocated RM5 million to the Plantation Industries and

^{2.10}Note, that the U.S. government also published the report “Findings on the Worst Forms of Child Labor” as well as the “List of Products Produced by Forced or Indentured Child Labor” report. While these reports overlap to a certain degree, they are not used in this chapter as they are much smaller. As a robustness check, regressions without including goods earlier mentioned in the “List of Products Produced by Forced or Indentured Child Labor” were performed however this did not change the conclusion of this chapter. These results are available on request.

^{2.11}Another similar act currently under the national congressional committee review is the “Business Transparency on Trafficking and Slavery Act” that was firstly introduced on August 1, 2011. The motivation behind this act is similar to “The California Transparency in Supply Chains Act” - the report measures taken to address slavery and child labor problems within business operations. The act would require all companies with \$100 million in gross receipts globally to inform the Securities and Exchange Commission and the public regarding the efforts being made to eliminate slavery and child labor from these companies’ supply chains. This act also explicitly mentions the extent of the problem outlined in the TVPRA list as a motivation for why action is needed (Maloney et al., 2011; Maloney and Smith, 2015).

Commodities Ministry to carry out a study in collaboration with the ILO with the stated aim of encouraging the DOL to remove Malaysian palm oil from the TVPRA list (New Straits Times, 2017). There are also a number of examples where companies themselves rely on the TVPRA list. The Walt Disney Company (2013), Ford (2014) and The Coca-Cola Company (2015) used the list as one of the key sources for their Corporate Social Responsibility reports and Code of Business Conduct policies concerning the potential for child or forced labor in their supply chains.

This list differs from previous awareness campaigns that have been studied in the literature. A key feature of other awareness campaigns is that they were focused on a specific sector and tried to target consumers by using media directly in an emotive way. By contrast, the TVPRA list is not actively promoted by the United States government and is intended to provide importing firms as well as consumers with trustworthy information about goods that are at high risk of being produced using child or forced labor. Updates to the list, however, are often covered in world media sources such as New York Times (2012) and The Guardian (2014b).^{2.12}

2.3 Data

The starting point for assembling the dataset was the “The List of Goods Produced by Child Labor or Forced Labor”. In total there are 139 goods in the list^{2.13}, which were aggregated into 103 industries.^{2.14} I used the harmonized system 1992 six digit level commodity codes HS6 codes to extract trade values (Comtrade UN Statistics Division, 2018) for each country and good combination for every year from 2002 until 2017. The sample consists of 188 countries, which includes 75 countries that were listed for at least one good and 113 other countries.^{2.15} All trade values were deflated with the U.S. import price indexes by the most disaggregated level available for each HS6 code. This was done before the trade values within each industry were added such that every country-industry-year was represented by one observation. For the robustness check section, I then augmented the dataset with GDP, population and exchange rate variables for the exporting countries from the World Bank Development Indicators (World Bank, 2018).

Table 2.1: Goods and countries added to the TVPRA list, by year

	2009	2010	2011	2012	2014	2016	Total
Unique goods on list	122	6	2	4	2	3	139
Unique countries on list	58	12	1	3	1	2	75
Country-goods added	281	30	8	26	11	27	379
Total country-goods	281	311	319	345	353	379	

^{2.12}This list is not without criticism however. There are still a number of concerns have been raised about the evidence base, transparency of selection of goods and countries and the addition and removal of countries from the list (European Commission, 2013; Rosenthal and Hawkins, 2015). The TVPRA admits that there are constraints when producing the list including data availability, the disproportional appearance of some countries on the list and countries with information gaps (United States Department of Labor, 2014). To the extent that these criticisms diminish public confidence in the list will act against establishing an impact on trade. The media and ILO indices are not subject to this critique however.

^{2.13}There are four goods that could not be included into the dataset due to a lack of data on Comtrade. These are miraa (stimulant plant), coca (stimulant plant), tanzanite and pornography.

^{2.14}For example, the goods “bricks” and “clay bricks” were combined into a single industry as were “granite” and “crushed granite”. Table 2.B.1 in appendix 2.B shows what goods were consolidated into the same industry.

^{2.15}Note that as listing occurs at a country-industry level, this chapter utilizes the term “listed country” to describe a country listed for at least one good.

The main information indicator is a dummy variable to indicate whether or not the country-industry-year was listed for child and forced labor on the TVPRA list. Overall, 379 listed goods and country combinations appeared on the list between 2009 and 2016. The annual additions of goods, countries and country-goods are shown in table 2.1. Note that there were some removals from the list in 2014 and 2016, which means the total differs from the sum of the additions.

I then constructed the media index from web-search counts of article searches for 28 newspapers^{2.16} in total consisting of 8 major U.S. newspapers and 20 regional newspapers between 2004 and 2015.^{2.17} The search queries I used were identical for all newspapers in order to get consistent results and consisted of country name, child and forced labor keywords as well as listed industry name and synonyms.^{2.18} Given the difference in newspapers circulation levels, I weight the media coverage index for each newspaper by its weekday circulation level. In order to create a sample representative of the U.S. population, I selected these newspapers based on a few criteria. First, collectively these newspapers are read by a large proportion of U.S. consumers with a share of total daily newspaper circulation of approximately 21%.^{2.19} The media sources were chosen from the list of the most circulated U.S. daily newspapers - eight newspapers used in this search are among the top ten most read in the United States (Cision, 2016). Second, the set of regional newspapers that I chose are well spread geographically and are not concentrated in one area with 24 states being represented.^{2.20}

This media data was converted into a media index. Denoting the raw number of media hits for newspaper n relating to country i , industry j in year t as $m_{n,i,j,t}$, the circulation of newspaper n as c_n and the sets of newspapers, countries, industries and years as N, I, J, T , the media index is calculated as:

$$\text{Media Index}_{i,j,t} = \log(1 + 1,000,000 \sum_{n \in N} \left[\frac{c_n}{C} \frac{m_{n,i,j,t}}{m_n} \right]) \quad (2.1)$$

Where C is the total circulation of all newspapers in the sample $C = \sum_{n \in N} c_n$ and a newspaper's hits from all queries is denoted $m_n = \sum_{i \in I} \sum_{j \in J} \sum_{t \in T} m_{n,i,j,t}$.^{2.21}

A potential source of endogeneity exists with the possibility that the media index could be correlated with U.S. imports as newspapers might be more likely to mention particular industries and countries depending on trade with them. Thus, I supplement the analysis with a third information measure, which is an index compiled from the ILO reports concerning child and forced labor in certain countries in certain years. The ILO is the leading international organization examining

^{2.16}The newspapers used are: Chicago Tribune, Los Angeles Times, New York Post, The Washington Post, New York Daily News, The Wall Street Journal, The Boston Globe, USA Today. The regional newspapers are Detroit Free Press, Baltimore Sun, Orlando Sentinel, Hartford Courant, Arizona Republic, Courier-Journal, Cincinnati Enquirer, Daily Press, Bangor Daily News, Reno Gazette-Journal, Asheville Citizen-Times, Argus Leader, Jackson Sun, Great Falls Tribune, The Spectrum, Burlington Free Press, Montgomery Advertiser, St. Cloud Times, Daily News Leader. Overall, around 7 million such websearches were performed.

^{2.17}Due to lack of media data in 2016 and 2017, the period used in this chapter for media analysis is between 2004 and 2015.

^{2.18}For example, the query for footwear in Russia was (“footwear” or “boots” or “shoes” or “heels” or “sneakers” or “sandals” or “flip-flops” or “sandals”) and (“Russia” or “Russian Federation”) and (“forced labor” or “child labor” or “exploitative labor” or “bondage” or “exploited labor” or “exploited worker”).

^{2.19}Author's calculations available upon request.

^{2.20}Figure 2.C.3 in appendix 2.C presents in blue in which states the newspapers have their publishing houses.

^{2.21}This formula is complicated but has the desirable properties that each newspapers contribution to the index is weighted by its circulation. In addition m_n is added to ensure that a low circulation newspaper that happens to have a disproportionately large number of hits in total cannot contribute disproportionately to the index. A multiple of one million is added such that the media index comes out to be in the range of approximately 0-10 but the implications of the regressions are similar with different constants here.

labor issues and has special focus on researching and counteracting child and forced labor internationally. The ILO’s “International programme on the elimination of child labor” is the largest dedicated child labor program in the world (International Labor Organisation, 2017). In terms of forced labor, the ILO established their “Special Action Programme to Combat Forced Labor” in 2002. This unit later published the first quantitative global estimate of forced labor prevalence in 2005 and has regularly undertaken research aimed at monitoring and combating forced labor internationally (International Labor Organisation, 2012).

ILO publications are categorised by subject matter, country and year. A publication count was taken for documents pertaining to child labor or forced labor for each country and each year. As this data is not industry specific, the corresponding index will be used in regressions where trade values are aggregated by exporting country.

$$\text{ILO Index}_{i,t} = \log\left(1 + \frac{1}{2}(\text{No.Child Labor Reports}_{i,t} + \text{No.Forced Labor Reports}_{i,t})\right) \quad (2.2)$$

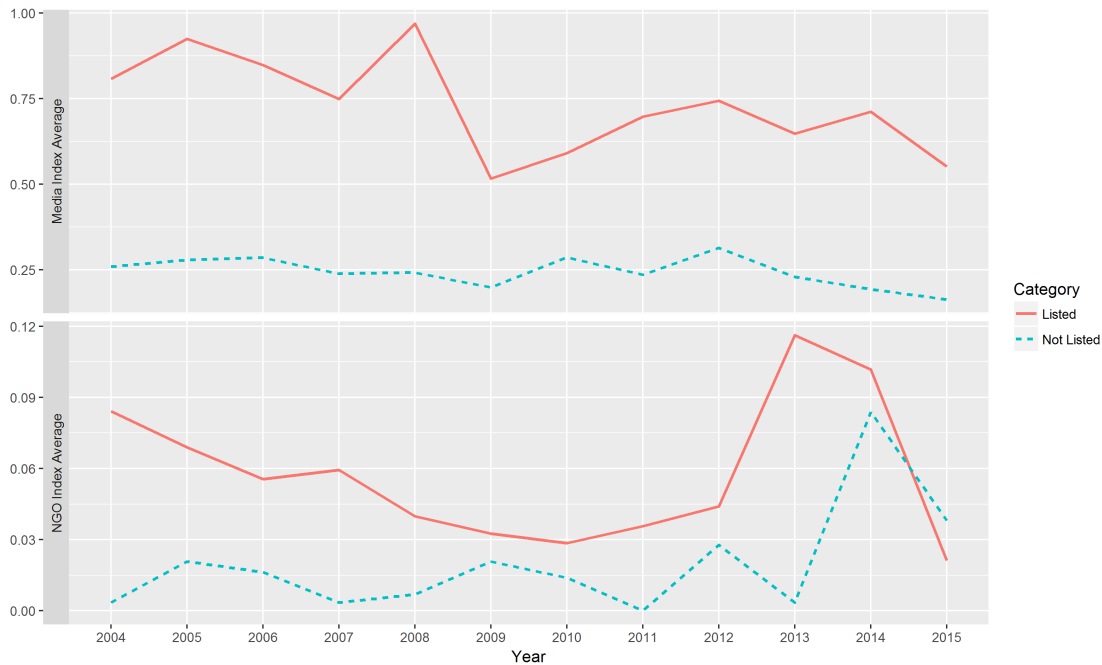


Figure 2.1: Listing, the media and ILO indices

The top panel of figure 2.1 presents the average media index for TVPRA listed country-industries against other country-industries. I present the media index in the top panel, where as expected, countries-industries that were listed have generally a high number of mentions in connection with labor rights in the media. This finding lends some external support to the validity of the media index. While any index composed of word searches will inevitably exhibit some noise, this figure shows that countries-industries that were listed systematically got more media coverage as measured by the index. The bottom panel shows the ILO index for listed countries against not listed countries. This shows that countries that have been listed for at least one good are more likely to have child and forced labor reports written concerning them.^{2.22}

^{2.22}There ILO index for listed and non-listed countries declined in 2015. This decline was larger for listed countries. There are no events in listed or non listed countries that led to this.

Summary statistics are presented in table 2.2. It shows that trade values are higher for listed country-goods; thus reflecting a tendency for child and forced labor to be used in goods that a country specialises in exporting. This also shows that the data is segmented in a way that listed country-goods get more media coverage than nonlisted country-goods. In addition, media is increased in the year of listing and the years following listing, reflecting the fact that listing can induce media coverage as well as the possibility that events can occur which reveal information leading to listing as well as media coverage. Capital goods get the most media mentions, followed by consumption goods and then intermediate goods. In terms of sectors, manufactured listed goods get the most mentions, followed by mining and agriculture. Panel C of Table 2.2 splits country-specific variables between listed countries and nonlisted countries. Listed countries receive more ILO forced and child labor reports concerning them, as compared to the nonlisted countries. The number of ILO reports does not change sharply when listing began in 2009, which supports the conclusion that the ILO's research is unlikely to be affected by TVPRA listing.

Figure 2.2 depicts which countries were listed and for how many goods they were listed.^{2.23} India was listed for the highest number of goods of all countries with 23 listed goods, followed by Brazil and Vietnam with each being listed for 16 goods. The majority of listed countries are from the Asia-Pacific region, followed by Latin America and the Caribbean region.

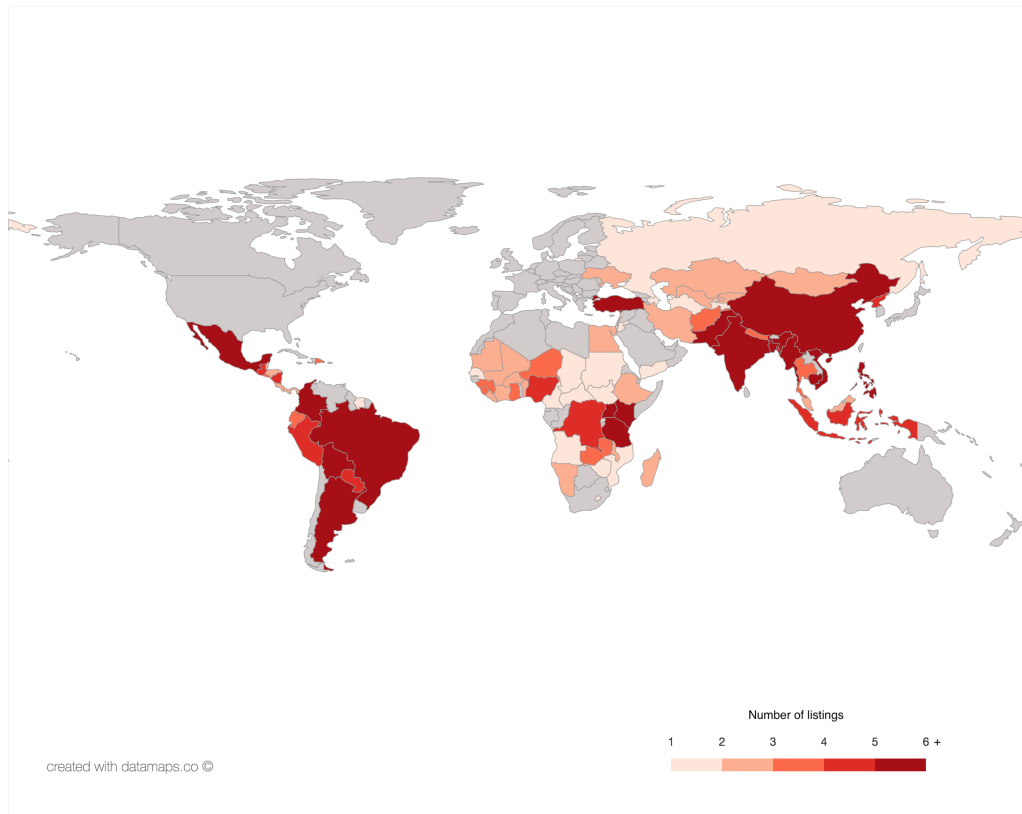


Figure 2.2: Listed countries

The industries in the TVPRA list are diverse and include consumption, intermediate and capital industries. Table 2.3 shows the proportion of listed industries in each category. Industries were

^{2.23}Note, that the graph includes all country-industries that appeared on the list, excluding the country-industries for which trade data is not available.

Table 2.2: Summary statistics

		Panel A:		Trade values				
		Listed no obs.	Listed mean	Listed SD	Not listed no obs.	Not listed mean	Not listed SD	P-value
All	5, 112	US\$ 694	US\$ 7,827	283,233	US\$ 18	US\$ 442	***	
2002-2009	2, 494	US\$ 514	US\$ 4,793	136,602	US\$ 17	US\$ 365	***	
2010-2017	2, 618	US\$ 866	US\$ 9,885	146,631	US\$ 18	US\$ 504	***	
Consumption	1, 888	US\$ 566	US\$ 2,809	123,320	US\$ 16	US\$ 200	***	
Intermediate	2, 867	US\$ 95	US\$ 703	153,314	US\$ 6	US\$ 98	***	
Capital	37	US\$ 59,330	US\$ 68,400	3,911	US\$ 546	US\$ 3,500	***	
Agriculture	2, 994	US\$ 59	US\$ 174	144,962	US\$ 4	US\$ 58	***	
Manufacturing	1, 062	US\$ 3,153	US\$ 16,950	82,207	US\$ 49	US\$ 807	***	
Mining	1, 056	US\$ 23	US\$ 88	56,064	US\$ 8	US\$ 136	***	
Child labor	3, 818	US\$ 83	US\$ 367	-	-	-	-	
Child and forced labor	884	US\$ 2592	US\$ 18170	-	-	-	-	
Forced labor	410	US\$ 2,298	US\$ 6,134	-	-	-	-	
Panel B: Average weighted newspapers mentions								
		Listed no obs.	Listed mean	Listed SD	Not listed no obs.	Not listed mean	Not listed SD	T-test
All	3, 852	20	88	220,548	4	33	***	
2004-2009	1, 605	26	110	91,895	5	41	***	
2010-2015	1, 926	16	66	110,274	3	26	***	
Consumption	1, 308	30	120	95,184	6	42	***	
Intermediate	2, 268	13	63	118,908	3	24	***	
Capital	36	120	220	4,452	5	40	***	
Agriculture	2, 220	12	58	112,224	3	26	***	
Manufacturing	828	51	150	68,736	7	45	***	
Mining	804	8	50	39,588	3	26	***	
Year of listing -3	321	26	120	-	-	-	-	
Year of listing -2	321	24	110	-	-	-	-	
Year of listing -1	321	29	110	-	-	-	-	
Year of listing	297	9.9	65	-	-	-	-	
Year of listing + 1	297	11	41	-	-	-	-	
Year of listing + 2	288	16	63	-	-	-	-	
Year of listing + 3	288	19	86	-	-	-	-	
Child labor	2, 880	14	64	-	-	-	-	
Child and forced labor	684	26	97	-	-	-	-	
Forced labor	288	64	190	-	-	-	-	
Panel C: Average ILO child and forced labor mentions								
		Listed no obs.	Listed mean	Listed SD	Not listed no obs.	Not listed mean	Not listed SD	T-test
All	1, 152	0.100	0.400	1, 856	0.032	0.173	***	
2002-2009	504	0.055	0.259	812	0.014	0.100	***	
2010-2017	576	0.143	0.484	928	0.050	0.223	***	

All trade values are to 3 significant figures and expressed in millions of US Dollars. Newspapers circulations are weighted by circulation and then multiplied by a million as per equation 2.1 (but no log applied). For disaggregation by child, forced, child and forced labor not listed still means not listed for either practice. A good-country included in child and forced labor will not be separately included in child labor or forced labor. The t-test column shows the p-value from running a t-test on the null hypothesis that listed and not listed values have the same mean. Significance is denoted by: * 10% level, ** 5% level, *** 1% level.

classified by whether more than 50% of the underlying 6 digit HS code goods were under the Broad Economic Categories Classification stage of production. The first column shows the number of industries belonging to each stage of production and the second column describes the percentage share of that good in the total number of goods. The third column in the table provides the share of industries in terms of their dollar value (in total U.S. imports) by their production stage. Over half of the listed industries are intermediate industries and their combined share in trade value is only 26%. Capital industries have the highest concentration in total imports.^{2.24} The majority of the goods that appeared on the list are labor intensive rather than capital intensive. This is in line with the literature. Busse (2002) found a positive relationship between child labor and exports of unskilled labor-intensive goods. He argued that child and forced labor increases the comparative advantage of the unskilled labor intensive industries in export markets. The majority of the goods that appeared on the TVPRA list come from the agriculture sector and are at the intermediate stage of production. These are relatively homogeneous and simple (i.e. bricks). However, a small number of industries are broader (i.e. electronics).^{2.25} I also disaggregate the industries based on sectors of production. About a half of the listed industries are in the agriculture sector, followed by manufacturing and mining. While agriculture has a greater number of listings than the other sectors, it only accounts for only 11% of total trade value. The majority of the listed imports by value are from the manufacturing sector - almost 80%.

Table 2.3: Composition of industries: 2010-2017

<i>by Stage of production</i>	Number of industries	Percentage of industries	Percentage by value
Consumption	44	43 %	44 %
Intermediate	56	54 %	26 %
Capital	3	3 %	30 %
<i>by Sector of production</i>			
Agriculture	53	51 %	11 %
Manufacturing	31	30 %	79 %
Mining	19	18 %	10 %

Note: stage of production allocated according to the Broad Economic Categories classification. Sector of production assigned according to the TVPRA report.

2.4 Empirical strategy

This chapter examines whether and to what extent the listing of forced and child labor practices of industries coming from various countries affects trade flows using the following econometric model:

$$M_{ijt} = \beta_0 + \beta_1 \text{Listed}_{ijt-1} + \theta_{ij} + \theta_{it} + \epsilon_{ijt} \quad (2.3)$$

The dependent variable, M_{ijt} is given by $\log(\text{Imports}_{ijt} + 1)$ where Imports_{ijt} is imports measured in U.S. dollars and discounted by the applicable U.S. price indices from country i of industry j at time t . The regressor of interest, Listed_{ijt-1} is a binary variable that equals one if an industry

^{2.24}This high concentration trade ratio is driven by the electronics imports to the U.S.. The imports share of electronics industry in total imports in capital stage is 92%.

^{2.25}Further details on the data sources, measurement and potential aggregation bias are given in appendixes 2.B and 2.C.

appeared on the TVPRA list, and zero otherwise. It is lagged by one year to reflect the fact that listing occurs in December, while the data used in this analysis is at the annual level.

The terms θ_{ij} and θ_{it} represent the country-industry fixed effects, country-time fixed effects and ϵ_{ijt} is the statistical error term. This chapter uses combined fixed effects and therefore explores the variation within trade flows from a particular country in a particular industry as well as controls for country-time specific events. One of the key challenges of econometric analysis of trade patterns (in particular in papers applying the benchmark “gravity model”) is the necessity to account for multilateral resistance (Anderson, 1979; Krugman, 1995; Anderson and van Wincoop, 2003). Multilateral resistance includes the competition effect of nearby countries. This chapter accounts for multilateral resistance and controls for all of these time invariant factors by using exporter-industry fixed effects.

The fixed effects approach controls for time-invariant heterogeneity that occurs at a country-industry level. This is a natural assumption in the international trade context as countries specialise in the production of various goods. Some examples are the large shrimp industry in Thailand and cocoa industry from Cote d’Ivoire, which are a result of those country’s respective natural endowments. Similarly countries where labor is relatively abundant continue specialise in producing labor intensive industries, for instance garments in Bangladesh and electronics in China. By including country-industry fixed effects we can explain changes in trade caused by time variant factors including the time variant controls and the treatment of interest, i.e. information revelation. Thus this identification strategy exploits only internal variation in trade flows between the U.S. and a certain country for a particular industry over time.

The second fixed effects pair at country-time level accounts for unobserved shocks to exporting countries that can occur over time. For example, if a country was subject to import sanctions that were lifted, the U.S. DOL might include some goods from this country into the TVPRA list to warn U.S. consumers.

The data structure is a balanced panel that has a substantial number of zero trade flows. That doesn’t imply measurement error as the unit of observation industry-country-time pair is very disaggregated. Thus the majority of zeros can be considered “actual” zero trade flows.

2.5 Results

I utilize two balanced datasets - the first consists of all country-industry combinations that are possible from all countries in all 103 listed industries. The second is the *pre-existing relationship* dataset where attention is restricted to country-industries that had a trading relationship with the United States pre-dating the TVPRA list. Country-industry pairs are included in the pre-existing relationship dataset if there were strictly positive import flows in at least 1 out of the 8 years from 2002 to 2009 (prior to listing).^{2.26}

Table 2.4 examines the trade impact of TVPRA listing on trade. Columns one and two are based on the full sample while columns three and four are based on the pre-existing sample. In columns two and four I use a two year lag to allow for a delay in the response to information revelation.

^{2.26}Robustness checks with a different threshold for defining a pre-existing relationship included in appendix 2.D.

Table 2.4: The effect of TVPRA listing of goods and countries on U.S. trade

	(1) All	(2) All	(3) Pre-existing	(4) Pre-existing
Listed t-1	-0.122 (0.158)		-0.190 (0.206)	
Listed t-2		-0.140 (0.163)		-0.293 (0.193)
R^2 (within)	0.884	0.888	0.811	0.819
N	271,052	253,759	106,967	100,132

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered across importers. Dependent variable is logarithm of imports to the U.S. All regressions with country and good, country and time fixed effects, year dummies and a constant. All regressions cover period 2002 - 2017. Within R^2 are reported.

For example, some firms might be locked in contracts at the time of listing and are not able to terminate them. All coefficients in all specifications do not reach statistical significance. Overall, the results as presented in table 2.4 provide no evidence that the naming and shaming of the TVPRA list itself had a statistically significant impact on U.S. imports.

One natural concern is that consumers continued purchasing goods which appeared in the TVPRA list because they were not aware of the poor labor conditions that went into the production of the good. I therefore use the media index described in section 2.3 to test whether media coverage of child and forced labor of a country-industry diminishes imports. I follow the same specification as in the equation 2.3 with the regressors of interest being one and two year lagged media indices in place of the Listed_{ijt-1} . Table 2.5 examines the effect of media coverage of listed industries over time for both datasets. The coefficients for media index are also not well determined in all specifications. This suggests there is no evidence of a statistically significant impact of media coverage about child and forced labor on United States imports.

Table 2.5: The effect of media coverage of listed goods and countries on U.S. trade

	(1) All	(2) All	(3) Pre-existing	(4) Pre-existing
Media index t-1	-0.00609 (0.00903)		-0.00879 (0.0120)	
Media index t-2		0.0127 (0.00880)		0.0137 (0.0120)
R^2 (within)	0.901	0.905	0.842	0.851
N	174,067	157,427	70,005	63,301

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered across importers. Dependent variable is logarithm of imports to the U.S. All regressions with country and good, country and time fixed effects, year dummies and a constant. All regressions cover period 2004 - 2015. Within R^2 are reported.

As a result of not physically marking products, TVPRA listing may be thought of as having a lesser impact on consumers than would occur with direct labelling. On the other hand firms that import products would be fully aware of the goods listed status and may move towards substituting suppliers of these goods. To some extent firms might change their suppliers in expectation of a

consumer backlash from media coverage of child and forced labor in good production. Thus, the next implication I test is whether industries that are closer to the consumer are more likely to have less trade as a result of naming and shaming. In order to do this I use the fixed effects regressions on the sample with all country-industry pairs (similar to the first column in Table 2.4) and divide the dataset by the stage of production. These categories are consumption, intermediate and capital. I also consider a sectoral decomposition of the industry with the sectors of agriculture, manufacturing and mining being used.

The results are presented in table 2.6 for each of these decompositions for both the whole sample and the pre-existing relationship sample. The coefficients of the lagged listing variables and the lagged media indices are shown. These results are consistent across all stages of production and sectors; the coefficients are negative but not well determined. The only exception is the two year lag of the media index for capital goods, which is positive and narrowly statistically significant. Due to the number of regressions being performed a single significantly positive result is likely due to chance and the overall evidence suggests no impact of listing or media. In this table the consumption sector being close to the point of the consumer exhibits the expected negative sign for listing for both existing and pre-existing relationship, however this remains statistically insignificant. Again, no evidence could be found for any statistically significant impact of information provision on trade and no evidence could be found for a differential impact for production stages closer to the consumer.

One concern with the measure is the possibility that the U.S. ILAB will list a good depending on that goods' recent trade with the United States. For instance it may be the case that increasing imports of a certain industry warrants more scrutiny of the industry's production and hence a greater chance of the industry being listed. This is unlikely to be the case for the U.S. TVPRA list. The ILAB explicitly states that they do not consider trade with the United States when compiling the list. They state that, *"The ILAB mandate directs TVPRA to monitor and combat child labor and forced labor in foreign countries and to develop a list of industries from countries. It does not restrict the list to industries that are exported to the United States. In most cases, ILAB does not have information about whether the goods on the list are consumed domestically or exported."* (U.S. Department of Labor. Bureau of International Labor Affairs. Office of Child Labor, Forced Labor, and Human Trafficking, 2015). Furthermore, many sources used in the preparation of the list are largely from international media organisations and NGOs who are unlikely to base investigation decisions on trade flows with the United States.

Nonetheless to avoid any possibility of endogeneity, the last measure of public awareness about child and forced labor which I use is the ILO index which is compiled using publication counts coming from the ILO. This index was discussed in section 2.3. The ILO index is collected at country-year level and hence the trade values are aggregated across industries. This implies that an observation represents a country's aggregate exports to the United States in that year. The benchmark specification is shown in equation 2.4.

$$M_{it} = \beta_0 + \beta_1 \text{ILO Index}_{it-1} + \alpha_t + \theta_i + \epsilon_{it} \quad (2.4)$$

Table 2.7 presents four regressions with the first two columns using log aggregate trade (across all goods) as the dependent variable. The third and fourth columns use aggregate trade of only

listed goods as the dependent variable, reflecting the fact that these goods are likely to be known as being at high risk of being produced with child and forced labor. The second and the fourth regressions use time variant controls that may explain exports to the United States. These are the GDP per capita, labor force to population ratio that account for capital and labor endowments of a country and the logarithm of the exporting country exchange rate.^{2.27} The results again suggest that there is no statistically significant impact of the ILO index on trade.

Overall, the results suggest no statistically significant effect of listing, media and ILO coverage on United States imports. A natural concern in econometric analysis is that specifications used do not take into account other important factors or suppress a lot of variation in the data. I address these concerns in Appendix 2.D, where I replicate the main results of this chapter allowing for different specifications: one is less restrictive using control variables and the other is more restrictive with demand shifters taken into account. These results do not change the conclusion of the paper.

^{2.27}More details on control variables is provided in Appendix 2.D.

Table 2.6: The effect of listing and media coverage on U.S. trade depending on stage and sector

	All Sample						Pre-existing					
	Stage			Sector			Stage			Sector		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Consumption		Intermediate	Capital	Agriculture	Manufacturing	Mining	Consumption	Intermediate	Capital	Agriculture	Manufacturing	Mining
Listed t-1	-0.155 (0.305)	-0.0963 (0.199)	0.186 (0.857)	-0.180 (0.195)	-0.270 (0.398)	0.0776 (0.412)	-0.371 (0.305)	-0.161 (0.278)	-0.0893 (1.159)	-0.179 (0.269)	-0.457 (0.380)	0.420 (0.782)
R^2 (within)	0.906	0.864	0.925	0.873	0.901	0.854	0.842	0.793	0.929	0.801	0.852	0.792
N	117,688	146,784	6,580	139,120	783,82	53,550	46,701	55,271	4,995	43,874	45,873	17,220
Media Index t-1	-0.00317 (0.0107)	-0.0109 (0.0147)	0.0260 (0.0669)	-0.000888 (0.0153)	-0.000273 (0.0117)	-0.0227 (0.0255)	-0.00441 (0.0144)	-0.0196 (0.0203)	0.0856 (0.0936)	0.00252 (0.0225)	-0.00690 (0.0143)	-0.0319 (0.0397)
R^2 (within)	0.920	0.883	0.938	0.893	0.915	0.873	0.868	0.826	0.942	0.835	0.874	0.824
N	76,483	93,283	4,301	88,451	51,976	33,640	30,826	35,915	3,264	28,491	30,374	11,140
Listed t-2	-0.111 (0.324)	-0.0469 (0.210)	-0.598 (1.109)	-0.122 (0.192)	-0.363 (0.407)	-0.104 (0.454)	-0.422 (0.278)	-0.160 (0.280)	-1.151 (1.453)	-0.221 (0.234)	-0.563 (0.404)	0.0241 (0.786)
R^2 (within)	0.909	0.868	0.927	0.877	0.904	0.858	0.850	0.800	0.932	0.810	0.857	0.800
N	110,168	137,387	6,204	130,284	73,495	49,980	43,708	51,719	4,705	41,073	42,987	16,072
Media Index t-2	-0.00386 (0.0105)	0.0246 (0.0138)	0.136* (0.0744)	0.0192 (0.0145)	-0.00107 (0.0107)	0.0295 (0.0292)	-0.0122 (0.0147)	0.0348 (0.0226)	0.109 (0.0983)	0.0247 (0.0226)	-0.0104 (0.0134)	0.0399 (0.0454)
R^2 (within)	0.923	0.887	0.942	0.897	0.917	0.878	0.876	0.835	0.947	0.846	0.880	0.834
N	69,190	84,310	3,927	80,036	47,115	30,276	27,880	32,445	2,976	25,762	27,513	10,026

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01. Standard errors are clustered across importers. Dependent variable is logarithm of imports to the U.S.. All regressions with country and good, country and time fixed effects, year dummies and a constant. All regressions that use *Listed* and *Log Listed* cover period 2002 - 2017. All regressions that use *Media Index* and *Log Media Index* cover period 2004 - 2015. Within R^2 's effects are reported.

Table 2.7: The effect of ILOs coverage of listed of goods and countries on U.S. trade

	(1)	(2)	(3)	(4)
	Log agg. trade	Log agg. trade	Log listed trade	Log listed trade
ILO index t-1	0.0796 (0.0804)	0.0619 (0.0838)	0.438 (0.290)	0.350 (0.230)
Controls	No	Yes	No	Yes
R^2 (within)	0.0332	0.0476	0.0160	0.0584
N	2,227	1,841	2,820	2,301

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Within R^2 s are reported. All regressions cover the period 2002 - 2017 and include country fixed effects, time dummies and a constant.

2.6 Conclusion

A number of surveys have shown a negative consumer reaction to goods produced under poor working conditions. A recent survey by the Walk Free Foundation (2015) has shown avid support for consumer action; with 66% of consumers in the United States stating that they would switch to other products if they found out that a good they consume was produced under slavery conditions, while only 14% answered that they would continue buying the product. Furthermore, more than half of American customers^{2.28} would trust the government to identify which products were made using slave labor. A number of surveys suggest that consumers are concerned about the labor conditions under which imported goods are produced, and that they are willing to pay extra for goods that were produced under good working conditions. However it is not clear whether customers will follow throughout these statements under real circumstances or are merely giving a socially acceptable answer.

This chapter investigated the trade effects of the information revelation of trade goods produced using child and forced labor. This was done employing three measures. The first was a dummy variable approach with the listing of a good on the United States Department of Labor's list of goods produced with child and forced labor. The second measure of public awareness was an index embedding media coverage data from 28 American newspapers. I matched these measures with a trade dataset disaggregated by industry and found no link between these information provision measures and the United States imports. A third measure was composed of ILO reports on child and forced labor that focused on specific countries. Again, this indicated that exporting countries do not experience a fall in their exports to the U.S. when the ILO published reports concerning child and forced labor in those countries.

A number of interventions have been presented as policy responses to child and forced labor. Some of these policy responses are relatively direct including measures discussed in the literature such as improving access to schooling (Edmonds and Pavcnik, 2005), the enforcement of labor standards (Basu, 2001) and the more extreme measure of trade sanctions (Basu, 2003). Other policy responses were based on information provision including labelling, boycotts and listing. As labelling and boycotts face significant costs and hence are difficult to implement broadly, listing has been suggested as an important approach to impact child and forced labor on a large scale.

This chapter found no evidence to support the hypothesis that the provision of information diminished a country's export prospects. Furthermore, the findings do not support the concerns raised by several embassies concerning the effect of the TVPRA list on trade. Whilst this result suggests that naming and shaming efforts will not lead to worsening of human rights outcomes by diminishing an exporting country's trade prospects, it also suggests that a naming and shaming strategy without more direct measures will not act as a large disincentive for countries that export goods made with child and forced labor.

^{2.28}After "don't knows" are removed.

Appendices

2.A Forced and child labor definitions and conventions

The List of Goods Produced by Child Labor or Forced Labor report uses the adopted definitions of indentured child and forced labor coming from International Labour Organisation Conventions. The definitions below are the exact definitions used by the United States Department of Labor (2014) during the creation of the list.

“Child labor under international standards means all work performed by a person below the age of 15. It also includes all work performed by a person below the age of 18 in the following practices: (A) All forms of slavery or practices similar to slavery, such as the sale or trafficking of children, debt bondage and serfdom, or forced or compulsory labor, including forced or compulsory recruitment of children for use in armed conflict; (B) the use, procuring or offering of a child for prostitution, for the production of pornography or for pornographic purposes; (C) the use, procuring or offering of a child for illicit activities in particular for the production and trafficking of drugs; and (D) work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children. The definitions used in developing the TVPRA List are based on standards adopted by the ILO. The ILO has adopted two conventions relating to child labor, the Minimum Age Convention, 1973 (C. 138) and the Worst Forms of Child Labor Convention, 1999 (C. 182). The ILO has also adopted two conventions relating to forced labor, the Forced Labor Convention, 1930 (C. 29) and the Abolition of Forced Labor Convention, 1957 (C. 105).”

“Forced labor under international standards means all work or service which is exacted from any person under the menace of any penalty for its nonperformance and for which the worker does not offer himself voluntarily, and includes indentured labor. Forced labor includes work provided or obtained by force, fraud or coercion, including: (1) by threats of serious harm to, or physical restraint against any person; (2) by means of any scheme, plan or pattern intended to cause the person to believe that, if the person did not perform such labor or services, that person or another person would suffer serious harm or physical restraint; or (3) by means of the abuse or threatened abuse of law or the legal process.”

2.B Mapping the TVPRA list to HS codes

This section clarifies the way the trade Harmonized System codes were selected from the Comtrade database. Harmonized system 1992 commodity codes at the most disaggregated level possible were selected for the trade dataset. Due to the presence of some aggregation in the trade data there exists the likelihood that overaggregation can bias the effect of a good listing towards zero. This is not a key concern for two reasons. The first is that it is avoided to the greatest possible extent in this chapter by using the most specific commodity disaggregation level for a given good description.^{2.29} The goal of this was to include only goods that had been named and shamed by matching the specificity of the TVPRA list as far as possible. The second is whilst a broad listing on the TVPRA list may necessitate the use of more aggregated data, this would not necessarily act against finding results because a broad TVPRA listing term would also “shame” a wider range of goods. All trade figures are deflated by U.S. import price indexes by the most disaggregated level available for the good (HS 4-digit, HS 2-digit and HS 1-digit levels).

Another important aspect of the trade code selection is the stage of production. United States Department of Labor (2014) states “...*if there was reason to believe that child labor or forced labor was used in the extraction, harvesting, assembly or production of raw materials or component articles and these materials or articles are subsequently used as inputs in the manufacture or processing of final goods under non-violative conditions, only the raw materials or component articles are included on the TVPRA List and only for those countries where they were extracted, harvested, assembled or produced. If child labor or forced labor was used in both the production or extraction of raw materials or component articles and the manufacture or processing of final goods, the raw materials or component articles and the final goods are included on the TVPRA List for those countries where the violative conditions were found.*”.

The list that matches industries and listed goods are in the table 2.B.1.

^{2.29}For instance where “soccer balls” were listed in the TVPRA list a 6 digit (highly disaggregated) HS code was used for “inflatable [sports] balls” rather than using a less disaggregated code covering all sporting equipment. Where the TVPRA list uses a broader term for a good (for instance “fish”), a broader (more aggregated) category is used.

Table 2.B.1: List of industries: part 1

Industry	Good Names	Industry	Good Names
1	Alcoholic beverages	27	Coffee
2	Artificial Flowers	28	Coltan (metallic ore)
3	Baked Goods	29	Copper
4	Bamboo	30	Corn
5	Bananas	31	Cotton, Cottonseed (hybrid)
6	Beans (green, soy, yellow), Pulses (legumes)	32	Cucumbers
7	Beef	33	Cumin
8	Blueberries	34	Diamonds, Gems, Emeralds, Rubies, Sapphires
9	Brassware	35	Eggplants
10	Brazil Nuts, Chestnuts, Cashews, Hazelnuts, Peanuts	36	Electronics
11	Bricks, Bricks (clay)	37	Fashion Accessories
12	Broccoli	38	Fireworks, Pyrotechnics
13	Carpets	39	Fish, Nile Perch, Tilapia, Dried Fish
14	Cassiterite, Tin	40	Flowers
15	Cattle	41	Flowers (poppies)
16	Cement	42	Fluorspar (mineral)
17	Ceramics	43	Footwear, Footwear (sandals)
18	Charcoal	44	Furniture, Furniture (steel)
19	Chile Peppers, Pepper	45	Garlic
20	Christmas Decorations	46	Garment
21	Citrus Fruits	47	Glass
22	Cloves	48	Glass Bangles
23	Coal	49	Goats
24	Cobalt	50	Gold
25	Cocoa	51	Granite, Granite (crushed)
26	Coconuts	52	Grapes

Table 2.B.2: List of industries: part 2

Industry	Good Names	Industry	Good Names
53	Gypsum (mineral)	79	Silk Cocoons, Silk Thread
54	Hogs	80	Silk Fabric
55	Incense (agarbatti)	81	Silver
56	Iron	82	Sisal
57	Jade	83	Soap
58	Leather, Leather Goods/Accessories	84	Soccer Balls
59	Lobsters, Shellfish, Shrimp	85	Stones, Stones (limestone), Stones (pumice), Gravel (crushed stones)
60	Locks	86	Strawberries
61	Manioc/Cassava	87	Sugar Beets
62	Matches	88	Sugarcane
63	Meat	89	Sunflowers
64	Melons	90	Surgical Instruments
65	Nails	91	Tea
66	Oil (palm)	92	Teak
67	Olives	93	Textiles, Textiles (hand-woven), Textiles (jute), Thread/Yarn, Embroidered Textiles (zari)
68	Onions	94	Timber
69	Palm Thatch	95	Tobacco, Bidis (hand-rolled cigarettes)
70	Physic Nuts/Castor Beans	96	Tomatoes
71	Pineapples	97	Toys
72	Potatoes	98	Trona (mineral)
73	Poultry	99	Vanilla
74	Rice	100	Wheat
75	Rubber	101	Wolframite
76	Salt	102	Yerba Mate (stimulant plant)
77	Sand	103	Zinc
78	Sesame		

2.C Media coverage map

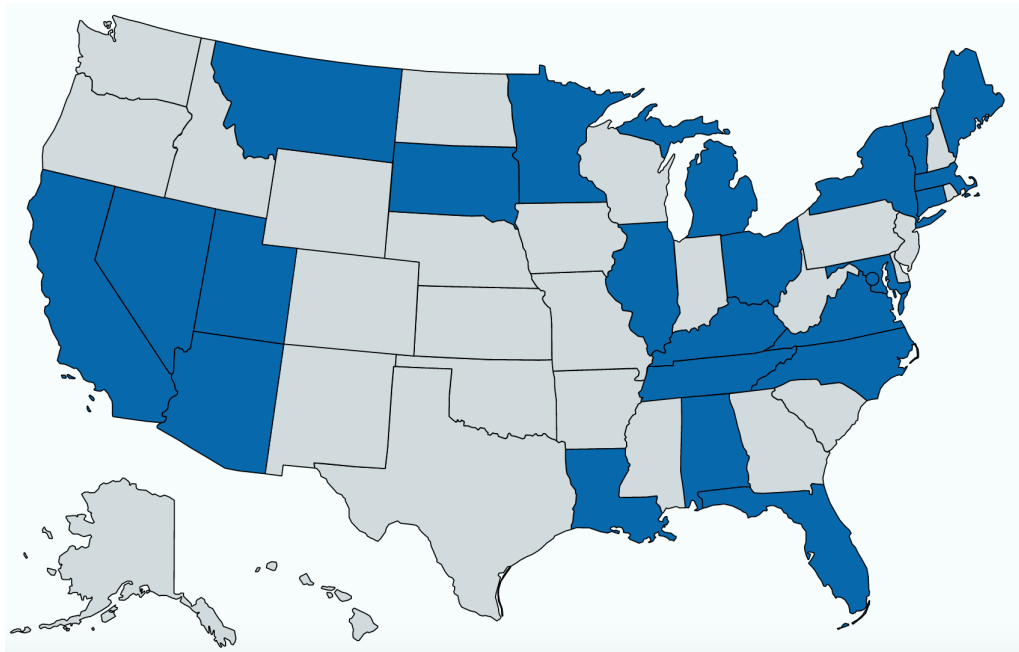


Figure 2.C.3: Media coverage of U.S. states

2.D Robustness

Robustness checks with different pre-existing relationship duration

I repeat the regressions of tables 2.4 and 2.5 with a different threshold for a pre-existing relationship. Table 2.D.3 shows the case when a threshold of 4 nonzero years is set and table 2.D.4 shows the case when trade must be positive in all years before listing. The results are consistent with previous findings suggesting no negative statistically significant effect of naming and shaming of child and forced labor on trade. The coefficient for media coverage with two year lag is vaguely statistically significant, which is likely due to luck given a large number of specifications ran in this chapter.

Table 2.D.3: The effect of TVPRA listing of goods and countries on U.S. trade (pre-existing relationship with 4 and 8 years)

	(1)	(2)	(3)	(4)
Listed t-1	-0.174 (0.223)		0.123 (0.179)	
Listed t-2		-0.245 (0.206)		0.108 (0.163)
R^2 (within)	0.766	0.778	0.846	0.849
N	71,163	66,591	48,487	45,365

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered by importing country. Dependent variable is logarithm of imports to the U.S.. All regressions with country and good, country and time fixed effects. All regressions cover period 2002 - 2017. Within R^2 s are reported.

Table 2.D.4: The effect of media coverage of listed goods and countries on U.S. trade (pre-existing relationship with 4 and 8 years)

	(1)	(2)	(3)	(4)
Media index t-1	0.00105 (0.0123)		0.00259 (0.00730)	
Media index t-2		0.0203* (0.0112)		0.00337 (0.00627)
R^2 (within)	0.809	0.823	0.871	0.875
N	46,493	42,017	31,645	28,593

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered by importing country. Dependent variable is logarithm of imports to the U.S.. All regressions with country and good, country and time fixed effects. All regressions cover period 2004 - 2015. Within R^2 s are reported.

Robustness checks with country-industry fixed effects

A natural concern for empirical studies is that the empirical strategy can suppress too much variation in the data and thus null result can be found. In order to address this concern, I use the empirical specification defined below. It explores the variation within country-industry over time, while also controls for major country time variant factors:

$$M_{ijt} = \beta_0 + \beta_1 \text{Listed}_{ijt} + \beta_2 \text{GDPPC}_{it} + \beta_3 \text{LabPop}_{it} + \beta_4 \text{ER}_{it} + \alpha_t + \theta_{ij} + \epsilon_{ijt} \quad (2.D.1)$$

The terms θ_{ij} and α_t represent the country-industry fixed effects as well as the year time dummies and ϵ_{ijt} is the statistical error term.

The regression equation controls for GDP per capita (GDPPC_{it}), labor force to population ratio (LabPop_{it}) and the exchange rate of the exporting country (ER_{it}). The exchange rate variable is the logarithm of the ratio of country i 's exchange rate in year t to its exchange rate in 2010.

These variables are included to control for the main time-variant factors that may explain exports to the United States. GDP per capita and labor force to population ratio account for capital and labor endowments of a country. Generally, more trade would be expected with countries that have more labor endowment. GDP per capita accounts for standard of living and economic performance of the exporting country. Finally, a higher value of the exchange rate indicates it is relatively cheaper for the United States to buy goods from the exporting country and so imports would be expected to be higher.

The results are presented in tables 2.D.5 and 2.D.6. In Table 2.D.5, I examine the trade impact of the TVPRA listing on trade. The effect of listing is statistically insignificant among all specifications. Table 2.D.6 examines the effect of naming and shaming using the media index. The results are consistent with table 2.5 findings and aren't statistically significant except vaguely significant two year lagged media index.

The regressions in tables 2.D.5 and 2.D.6 exhibit lower R^2 than other papers that use a similar format (for instance Fuchs and Klanna (2013)) primarily because those regressions use more disaggregated trade data. This greatly increases the number of observations. In addition, less aggregated data generally have a higher relative variance. Coefficients are also not specific for a particular industry as there are different industries in the regression. For every country-year cross section there exist over 100 different industries. When regressions are restricted to a single industry the R^2 values increase to the range of between 1% and 5%. Also, when I remove many zero trade relationship by restricting attention to country-industries with a pre-existing trade relationship the within R^2 values are increased by a factor of about 5.

Table 2.D.5: The effect of TVPRA listing of goods and countries on U.S. trade using alternate empirical specification

	(1) All	(2) All	(3) Pre-existing	(4) Pre-existing
Listed t-1	-0.0385 (0.157)		-0.0287 (0.202)	
Listed t-2		-0.0496 (0.180)		-0.124 (0.217)
Controls	Yes	Yes	Yes	Yes
R^2 (within)	0.00194	0.00220	0.00485	0.00543
N	219,461	205,020	87,204	81,466

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered across importers. Dependent variable is logarithm of imports to the U.S. All regressions with country and good fixed effects, year dummies, controls and a constant. All regressions cover period 2002 - 2017. Within R^2 are reported.

Table 2.D.6: The effect of media coverage of goods and countries on U.S. trade using alternate empirical specification

	(1) All	(2) All	(3) Pre-existing	(4) Pre-existing
Media index t-1	-0.00384 (0.00887)		-0.00608 (0.0123)	
Media index t-2		0.0163* (0.00884)		0.0199* (0.0118)
Controls	Yes	Yes	Yes	Yes
R^2 (within)	0.00165	0.00232	0.00633	0.00598
N	169,786	170,465	69,113	69,375

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered across importers. Dependent variable is logarithm of imports to the U.S. All regressions with country and good fixed effects, year dummies, controls and a constant. All regressions cover period 2004 - 2015. Within R^2 are reported.

Robustness checks with three pairs of fixed effects

Another natural concern about identification strategy in empirical studies is that regressions do not control for other important time variant factors. One important factor in the context of this chapter is that demand could change over time. Although I do not use very long time span for demand to change significantly, nevertheless I replicate tables 2.4 and 2.5 with the three level fixed effects: at country and good, country and time, time and good levels following the specification provided in equation 2.D.2.

The results of this specification are in the tables 2.D.7 and 2.D.8. They support previous findings, suggesting there is no statistically significant impact of information provision about child and forced labor in the production of goods on international trade.

$$M_{ijt} = \beta_0 + \beta_1 \text{TVPRA}_{ijt} + \phi_{jt} + \theta_{ij} + \lambda_{it} + \epsilon_{ijt} \quad (2.D.2)$$

Table 2.D.7: The effect of TVPRA listing of goods and countries on U.S. trade using three level fixed effects

	(1) All	(2) All	(3) Pre-existing	(4) Pre-existing
Listed t-1	-0.0787 (0.151)		-0.141 (0.203)	
Listed t-2		-0.0787 (0.156)		-0.217 (0.193)
R^2 (within)	0.882	0.885	0.815	0.823
N	233,645	218,560	89,415	83,561

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01. Standard errors are clustered across importers. Dependent variable is logarithm of imports to the U.S. All regressions with country and good, country and time, time and good fixed effects and a constant. All regressions cover period 2002 - 2017. Within R^2 are reported.

Table 2.D.8: The effect of media coverage of listed goods and countries on U.S. trade using three level fixed effects

	(1) All	(2) All	(3) Pre-existing	(4) Pre-existing
Media index t-1	0.00113 (0.00968)		0.00395 (0.0135)	
Media index t-2		0.0139 (0.00999)		0.0145 (0.0139)
R^2 (within)	0.898	0.902	0.844	0.853
N	151275	136415	59243	53411

Standard errors in parentheses * p<0.10, ** p<0.05, *** p<0.01. Standard errors are clustered across importers. Dependent variable is logarithm of imports to the U.S. All regressions with country and good, country and time, time and good fixed effects and a constant. All regressions cover period 2004 - 2015. Within R^2 are reported.

Chapter 3

The effect of foreign competition on family and network labor allocation*

3.1 Introduction

More than a half of the 1.45 billion workers in the developing world are either self-employed or are unpaid family workers in a family firm (International Labour Organization, 2014). Given the substantial share of unpaid family labor in developing countries, a number of scholars have highlighted the importance of household labor as well as the factors that lead to more or fewer family workers in a firm (Deolalikar and Vijverberg, 1987; Reardon, 1997; Barrett, Reardon and Webb, 2001; Brookfield and Parsons, 2007). An important related research question is whether increases in foreign competition affect the utilisation of family workers. This chapter will show that in the face of foreign competition, less financially stable households adjust their labor supply decisions towards more family members working for wage employment in other firms. This is important to understand from a policy perspective as it has implications for how foreign competition may lead to more efficient resource allocation within households.

There are compelling reasons to believe that foreign competition might be important in explaining family labor supply decisions. On the one hand, the uncertainty created in the market by increasing foreign competition might lead to family workers remaining at the firm in order to help sustain the family business in the face of this competition. A key difficulty faced by small firms in the face of foreign competition is finding labor when the market wage is higher and family workers

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may be useful in filling this gap. This is consistent with the seminal trade model of Melitz (2003), which predicted that trade liberalisation will lead to low productivity enterprises facing pressure as they cannot afford the labor costs. Having access to family workers can provide a mechanism through which such a firm could cope with increased competition. On the other hand, foreign competition might lead to family workers leaving the family firm in order to exploit higher wages that are available in the general economy as well as to diversify household income given the greater uncertainty around the future of the household firm.

I investigate whether foreign competition affects household labor reallocation using a panel of around 3,000 household manufacturing firms from Vietnam over the period from 2005 to 2013. Vietnam offers a good example of a developing economy, which introduced a number of reforms and enterprise development laws since the 1980s. Vietnam joined the World Trade Organisation (hereafter WTO) in 2007, which led to the country becoming more exposed to the global market. I apply two measures of foreign competition: import penetration (similar to the measure used by Bloom and Van Reenen (2007)) and the actual level of imports. I use the variation within firms over time and find that when firms face greater foreign competition, they tend to employ fewer unpaid workers.^{3.1} I then use within household variation to find that the proportion of family labourers working at a household firm decreases as that firm faces foreign competition. I find that these results are stronger for less financially stable firms.

Previous studies that examined the relationship between family labor and trade liberalisation primarily focused on the largely informal agricultural economy (i.e. Edmonds and Pavcnik (2006)). This chapter's contribution is the provision of a better understanding of the effect of full market trade liberalisation on the reallocation of family labor for formal and informal enterprises. The closest papers to this research are two papers by McCaig and Pavcnik (2014, 2018), which examined the effect of a positive export shock in Vietnam^{3.2} on the allocation of household labor. McCaig and Pavcnik (2018) found that an increase in export market opportunities led to a reallocation of 5% of manufacturing workers from informal firms (primarily household businesses) to employers in the formal enterprise sector. McCaig and Pavcnik (2014) showed that household businesses in industries with greater tariff cuts expanded their revenues and were more likely to hire non-family members as workers.

My results are consistent with the findings of McCaig and Pavcnik (2014, 2018), this paper builds up on them by examining the mechanisms in play as well as linking the results of these two papers. I identify the number of family, non-family, paid and unpaid labor employed at each firm over time and thus can explore the dynamics of hiring inside and outside labor. I present the mechanism that import competition leads household members to leave family firms in order to diversify the income source of the households. The implications of this mechanism are supported when I account for heterogeneity of firms in the sample. In particular, the effect of household workers leaving family firms is greater for poorer firms as well as for firms that provide the primary income source for

^{3.1}Unpaid labor is likely to consist of household and network labor. There are a number of ways this can be established for the Vietnamese firms in the dataset. Firstly, the correlation between unpaid labor and family labor in the sample used for this analysis is around 80%, which suggests that a large part of unpaid labor consists of household workers. Secondly, when the difference between unpaid and family labor is taken by the firm in this sample, these do not equal zero for a number of cases. This suggests that the remaining part of the workers is likely to consist of other relatives and friends. Nguyen and Nordman (2017) used a sample of household firms in Vietnam and argued that unpaid labor consists of family and kinship labor.

^{3.2}The export shock explored in the paper is the US-Vietnam Bilateral Trade Agreement, which created export opportunities for Vietnamese firms. This is because Vietnam has already applied Most Favoured Nation tariffs and the negotiations were about lowering Vietnam's import tariff to the US

their household even when controlling for the market wage.

This chapter is also related to the literature that investigates the impacts of trade liberalisation on firm dynamics and in particular on labor allocation. A large body of research examining the impact of trade liberalisation in developing countries focuses on wage changes (Borjas and Ramey, 1995; Feliciano, 2001; Attanasio, Goldberg and Pavcnik, 2004). For example, Fukase (2013) used the US-Vietnam Bilateral Trade Agreement to show that the provinces that were more exposed to export expansion experienced higher unskilled labor wage growth and much smaller growth in the relative wages of skilled labor as compared to other provinces. Other papers in the literature explored the effects of trade policies on hiring patterns and the welfare of workers (Krishna and Senses, 2014; Dix-Carneiro, 2014; Autor et al., 2014; Caliendo, Dvorkin and Parro, 2015). Menezes-Filho and Muendler (2011) used employer-employee linked data from Brazil to examine the effect of tariff cuts on labor allocation. The paper found that trade liberalisation leads to worker displacements and fewer hirings. Autor, Dorn and Hanson (2013) examined the case of United States imports from China with the identification strategy exploiting regional variation in industrial specialisation. The paper found that import competition from China explains a quarter of the decline in the US' employment in manufacturing.^{3.3}

The chapter proceeds as follows. The case of Vietnam and the potential mechanisms by which foreign competition can affect family labor are described in section 3.2. The data is then presented in section 3.3, while section 3.4 describes the empirical strategy. Sections 3.5.1 and 3.5.2 discuss the empirical results, section 3.6 provides the robustness checks before section 3.7 concludes.

3.2 Background and mechanisms

3.2.1 Background

Vietnam is a prominent example of a fast-growing Asian economy. This country has experienced rapid economic growth since the late 1980s, as it moved from a centrally planned to a socialist-oriented market economy. The transition happened through a number of economic and political reforms called the “Doi Moi” reforms. Vietnam applied for accession to the WTO in 1995 and since then the country has gone through several legal reforms and programmes mandated as part of the negotiations. These reforms resulted in Vietnam becoming the 150th WTO member on the 11th of January 2007. This accession accelerated Vietnamese trade liberalisation and increased competitive pressure on the domestic sector. While the domestic sector experienced intense international competition, studies have found that WTO accession had an overall positive effect on the economy of Vietnam (Abbott and Tarp, 2011).

As Vietnam grew, the number of Vietnamese SMEs also increased substantially. The growth rates in SMEs was especially high after the Vietnam Enterprise Law of 1999 was implemented. As of 2012, SMEs constituted 97.7% of all firms and employed 46.8% of the Vietnamese labor force (Asian Development Bank, 2015). The manufacturing sector employed 14.1% of the total population in

^{3.3}The literature that examines the effect of China's exports on labor outcomes in destination countries is rapidly growing. See also Autor et al. (2014); Balsvik, Jensen and Salvanes (2015); Acemoglu et al. (2016); Pierce and Schott (2016); Hombert and Matray (forthcoming).

2014. Cling, Razafindrakoto and Roubau (2011) estimated that there are 10.3 million household firms operating in Vietnam, with around 82% of these being informal household businesses. According to their estimates, the majority of workers in the Vietnamese informal economy are either self-employed or family workers. For instance, in Hanoi's manufacturing industry unpaid workers account for 23.4% of the total labor and in Ho Chi Minh City this figure was 21.7%.

The effect of WTO accession is arguably an exogenous shock for household firms in Vietnam (i.e. Newman, Rand and Tarp (2013); Baccini, Impullitti and Malesky (2017)). Firstly, Vietnam had low bargaining power during the tariff reduction discussion with the WTO. Secondly, household enterprises do not export or import goods. For example, under 1% of household firms in the sample used in this research sold goods for direct export or to foreign invested companies. The majority of these enterprises exclusively sold goods to the domestic market.^{3,4} Household firms were mostly affected by the international trade through competition in the market for their final goods.

3.2.2 Mechanisms

There is a large literature that examines how households react to shocks and whether they diversify income in response to these shocks. The drivers of income diversification are characterised as “push” and “pull” factors (Reardon, 1997; Ellis, 2000; Barrett, Reardon and Webb, 2001; Hagglade, Hazell and Reardon, 2007). Push factors relate to external events that cause income fluctuations in households (i.e. drought, rainfall instability, diseases) and lead them to adopt income diversification strategies to mitigate negative income shock. Pull factors refer to opportunities (i.e. higher payoffs, lower risk) in terms of household incomes. Trade liberalisation of a country provides opportunities for export (a “pull” factor) as well as increases the level of imports (a “push” factor). It is unlikely, however, that export opportunities emerged for small household firms in the short run. The adverse impact of increased imports is likely to outweigh any potential export opportunities for these firms.

The effect of the liberalisation of trade on workers allocation has been examined in several studies. Menezes-Filho and Muendler (2011) showed that import penetration led to worker displacements in Brazil. Wacziarg and Wallack (2004) performed a study of 25 trade liberalisation episodes and showed a weakly negative effect of trade liberalisation on the extent of inter-sectoral labor reallocation. McCaig and Pavcnik (2018) found that workers reallocated from household firms to larger enterprises in response to a positive export shock in Vietnam.

Recent literature has established the heterogeneous effects of trade liberalisation on firm outcomes within an industry. Trade liberalisation leads to export market entry and expansion for highly productive firms, which in turn leads to further improvements in the aggregate productivity of the industry (Melitz, 2003). Thus, trade liberalisation is likely to present opportunities for larger, more productive Vietnamese firms to expand and export. These firms could also be adversely affected by higher wages in the labor market, which could counteract any gains from export access. At the same time, low productivity firms will exit the market due to heightening labor costs. Furthermore, trade liberalisation will lead to a reallocation from less productive firms towards more productive firms. Thus, consistent with Melitz (2003), trade liberalisation in Vietnam should have led to a

^{3,4}For instance to individuals, households, tourists, non-commercial government authorities as well as state and non-state enterprises

decline in employment in less productive firms (which are likely to be household enterprises) and a rise in employment in better performing enterprises. Smaller, less productive Vietnamese firms will not generally be able to enter the export market but will face greater competition in their product market from imports and higher costs in the labor market (consistent with the mechanism of McCaig and Pavcnik (2014)). This increased competition for workers in the labor market and competition for buyers in the product market may have implications for labor supply decisions of the household firms.

Firms facing heavy competition and rising market wages may be less likely to survive in the long term. There are a number of ways in which household firms could adjust their family and network labor in response to this possibility. The first mechanism is income diversification. Household workers may decide to leave the firm in order to diversify household income due to increased uncertainty about the future. This effect is likely to be accentuated if the opening up of trade boosts wages available at other firms. On the other hand, the effect of international trade on household labor might be the opposite - increased international trade may lead to more household workers joining their family firms in order to help firms survive. A third possible impact of international trade on household labor is that increased wages might attract previously non-working family members to join the labor force. In the subsequent sections of this chapter, these mechanisms will be examined.

3.3 Data

I use five waves of the Small and Medium Enterprise Survey collected in Vietnam between 2005 and 2013 at biannual frequency. The survey was gathered by the Vietnamese General Statistics Office.^{3.5} Each wave contains information on about 2,500 enterprises operating in the manufacturing sector across ten provinces in Vietnam. As the focus of this chapter is on the household response to foreign competition, the analysis is restricted to household-owned firms. The final sample consists of around 1,800 firms operating in each wave.^{3.6} Each enterprise in the survey was asked to report the industry of operation based on the 4-digit International Standard Industrial Classification (hereafter ISIC) code system. I matched these industry codes with import and export data for Vietnam from the World Integrated Trade Solution database (The World Bank, 2017). I then augmented the dataset with the revenue for 4-digit ISIC industries using the Enterprise Census data. All trade and revenue values were then deflated with the annual consumer price index.

I first explore the time patterns of the key variables in Table 3.1. As expected, imports and exports grew substantially after WTO accession in 2007. Consistent with Vietnamese macroeconomic data,^{3.7} the household firms in the SME dataset shrank in size after WTO accession. These household firms also reduced the number of paid and unpaid labor. The share of unpaid labor in

^{3.5}The first two waves correspond to the period before WTO accession, and the last three waves represent the post-joining period. The data for each wave was collected the year before it was released. Thus, the 2005 survey corresponds to the 2004 year data. Vietnam joined WTO in January 2007. Therefore the first two waves (2005, 2007) are considered as the pre-WTO period.

^{3.6}In order to maximise the sample size available, I use a sample of firms which reported it was a household establishment at least once. The results are robust to the specifications described by equations 3.1 and 3.4 for the sample which reported household business ownership during all waves.

^{3.7}Available on request.

Table 3.1: Summary statistics by wave

	2005	2007	2009	2011	2013
Exports	199,345	210,998	317,224	433,645	664,450
Imports	235,505	354,353	516,322	599,513	776,483
Tariff	18.77	15.31	13.05	10.89	10.26
Unpaid labor share	0.47	0.49	0.50	0.53	0.54
Total labor	7.54	7.62	7.34	6.67	5.85
Unpaid labor	1.91	2.03	1.90	1.85	1.85
Paid labor	5.63	5.59	5.44	4.82	4.00
Labor hired	0.76	0.93	0.77	0.56	0.40
Labor left	0.57	0.72	0.72	0.48	0.46
HHW ratio	0.51	0.51	0.72	0.71	0.69
HHM working elsewhere	0.73	0.72	1.17	1.10	1.03
HHM working at firm	2.12	2.10	2.08	1.94	1.98
HHM inactive	2.15	2.02	1.63	1.61	1.60

Source: Authors' calculations based on Vietnamese Small and Medium Enterprise surveys. Imports, exports and tariffs are averaged across all industries; all other variables are averaged across all firms. Note, that imports and exports expressed in 1,000 U.S. dollars.

firms (unpaid labor share)^{3.8} increased throughout the years, which reflects the fact that firms were losing paid workers at a higher rate than unpaid employees.^{3.9} The SME questionnaire asked each firm representative (either owner or manager) the number of family members that work for the firm, were employed at another firm for a wage at both full-time and part-time levels or were self-employed. The last four variables in Table 3.1 present the participation of those family members in the labor force. The average number of household members working for the household firm declined from 2.12 to 1.98, while employment outside of the firm increased substantially from 0.73 to 1.03 throughout the years. The ratio of family workers employed at the firm to family workers employed elsewhere, which I will call the HHW ratio,^{3.10} largely increased after the WTO accession. This pattern can also be observed in Figure 3.1, where I limit the sample to owner families only and separate it by part-time and full-time employment.

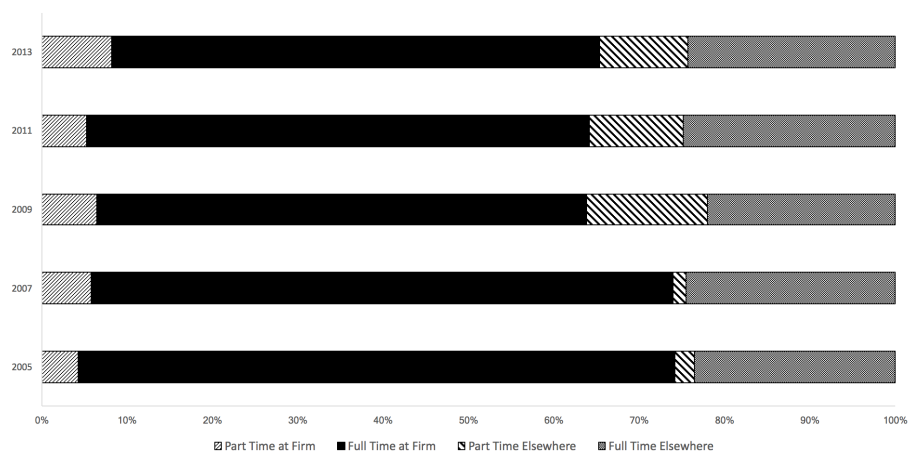
Figure 3.1 presents the composition of family labor working for the household firm and employed somewhere else (either at other firms or are self-employed). Prior to trade liberalisation (waves 2005, 2007), 74% of household members worked at a family firm, however, this share dropped to about 64% after Vietnam joined the WTO. The share of full-time employment at the firm declined from 70% to 57%, while the share of part-time workers at firms elsewhere increased from 2% to 12% between 2005 and 2013. Given these fluctuations, it is likely that some family members reallocated from full-time to part-time jobs at the firm, while at the same time some household members that used to be inactive joined the family business.

The descriptive statistics show that the firms in the sample had different labor compositions before and after WTO accession. Thus, in Table 3.2 I further explore whether the WTO entry is associated with statistically significant changes in other firm characteristics. Given that I rely on a subsample of the SME survey consisting of household firms, I use the remaining sample of 3,725 observations of other (generally larger) firms in the survey to estimate external wages. I predict external wage

^{3.8}The variable is defined in equation 3.2.

^{3.9}Note that this table is based on the unbalanced sample. There is a stronger declining pattern for unpaid labor in the balanced sample. The number of unpaid labourers decreased from 2.00 to 1.82 between 2005 and 2013.

^{3.10}The variable is defined in equation 3.5.



Source: Authors' calculations based on Vietnamese Small and Medium Enterprise Surveys.
The graph is based on the owners' responses sample.

Figure 3.1: Household employment structure

based on province, sector and year. Note, in the main analysis I do not use the sample that I used to predict wages in order to avoid double using the data. Consistent with the literature (Feliciano, 2001; Melitz and Ottaviano, 2008), external wages increased after the trade liberalisation. The labor fired to hired ratio^{3.11} rose, which indicates that after 2007 firms were losing more workers than hiring new workers. The enterprises that hired labor experienced more difficulties with finding workers after trade liberalisation, which could be due to better employment opportunities available in non-household firms (McCaig and Pavcnik, 2018). Finally, the financial performance of firms appeared to improve slightly.

Table 3.3 provides descriptive statistics by sector in order to explore heterogeneity between industries. I follow the standard ISIC classification and group the data into eight unique categories. The two sectors with the lowest self-reported competition^{3.12} (manufacturers of food products, 33.5% of enterprises, and producers of wood, paper and publishing, 16.4% of firms), had the lowest ratio of family workers leaving the household firm and the highest unpaid labor share. The two sectors with the largest self-reported competition (manufacturers of metals, 20.6% of firms, and producers of machinery and other equipment, 10.1% of firms), had the lowest unpaid labor share and the highest household workers ratio. This suggests a positive link between competition and the ratio of household members leaving the firm as well a negative relationship between competition and share of unpaid workers at these firms.

Firms that enter or exit the market, as well as firms that switch industries, might cope differently with foreign competition than other firms. For example, Newman, Rand and Tarp (2013) used a sample of Vietnamese manufacturing firms and found that firm switchers tend to follow different behaviour and have distinct characteristics compared to firms that exit and enter the market. In particular, the authors found a positive relationship between trade liberalisation and switching behaviour. Table 3.A.2 in the Appendix explores these possible differences using t-tests for the firms that entered, exited the market and switched the industry.^{3.13} This table shows that firm

^{3.11}I define this measure as the difference between fired and hired regular labor over total regular labor.

^{3.12}Every firm was asked about the level of competition it faced on an ordered categorical scale from no competition to severe competition. I use an indicator which is zero if a firm experiences no competition and one if a firm reported at least a "low level" of competition.

^{3.13}Table 3.A.1 shows the number of firms entering, switching and exit the market over time.

Table 3.2: T-tests analysis: WTO accession

	Before WTO no obs.	Before WTO mean	Before WTO SD	After WTO no obs.	After WTO mean	After WTO SD	P-value
Log external wage	3, 806	9, 769	0, 232	5, 242	10, 081	0, 219	***
Fired to hired ratio	3, 777	-0, 076	0, 207	5, 245	-0, 050	0, 208	***
Labor hired	3, 807	0, 848	3, 917	5, 246	0, 578	3, 782	***
Labor fired	3, 777	0, 046	0, 520	5, 247	0, 096	0, 685	***
Labor left	3, 777	0, 580	2, 094	5, 247	0, 455	1, 892	***
Hiring issues	1, 955	0, 193	0, 395	2, 428	0, 215	0, 411	***
Network hiring	2, 842	0, 880	0, 325	3, 475	0, 894	0, 308	***
Revenue	3, 807	1, 063, 894	3, 173, 281	5, 245	1, 197, 083	4, 275, 560	*
Profit	3, 807	184, 826	605, 895	5, 244	203, 215	670, 463	*
Financial assets	3, 807	166, 889	836, 078	5, 245	174, 288	868, 320	*

Table 3.3: Descriptive statistics by industries

	Percentage of firms	Competition	HHW ratio	Unpaid labor share	Hiring issues	Total labor	Hired labor	Labor left
Manufacture of food products, beverages and tobacco	0.335	0.819	0.541	0.662	0.143	4.978	0.410	0.338
Manufacture of textiles, wearing apparel and accessories	0.110	0.868	0.563	0.398	0.300	12.220	1.583	1.174
Manufacture of wood, paper and publishing	0.164	0.818	0.601	0.591	0.160	6.295	0.444	0.333
Manufacture of petroleum, rubber, chemicals and other non-metallic mineral products	0.253	0.842	0.624	0.443	0.186	8.659	0.819	0.563
Manufacture of metals	0.206	0.896	0.780	0.435	0.224	5.180	0.526	0.429
Manufacture of machinery and other equipment	0.101	0.884	0.657	0.311	0.287	9.762	1.085	0.833
Manufacture of transportation equipment and furniture	0.159	0.876	0.664	0.394	0.228	8.254	0.845	0.471
Total	1	0.851	0.626	0.505	0.205	7.030	0.691	0.508

Source: Authors' calculations based on Vietnamese Small and Medium Enterprise Surveys.

switchers and non-switchers are not statistically significantly different in means for the majority of labor characteristics. The firms that switched industry hired less labor, experienced more difficulties with finding it (likely due to an adjustment to a new industry) and had a higher ratio of household members leaving the firm compared to the firms that stayed in the industry. Firms that left the market (Panel C in Table 3.A.2), had lower shares of unpaid and family workers compared to surviving firms. They did not fire labor more than survivors, however, the workers were voluntarily leaving the firm at a much higher rate compared to surviving enterprises.

This section showed that imports and exports have a negative relationship with the share of family labor employed at the firm. Self-reported competition has a negative relationship with the share of unpaid labor employed at the firm. It also provides evidence that there was a change in the majority of firm characteristics after trade liberalisation. Furthermore, there is also the potential of heterogeneous effects for firms depending on whether they are industry switchers, exits or entrants into the market.

3.4 Empirical strategy

This chapter uses an unbalanced sample of manufacturing firms in Vietnam and follows two approaches to examine the effect of foreign competition on the allocation of network and family workers. The first approach examines the composition of family and network workers in a firm's labor force using the sample of unpaid workers. The second approach uses a subsample of firm owners and focuses on the allocation of family workers inside and outside of their firm.

3.4.1 Unpaid labor at firms

Household firms can readjust their family and unpaid labor in response to foreign competition in several ways as discussed in section 3.2.2. Workers might leave the firm in order to diversify income or to obtain higher wages; they can also remain at the firm in order to help it cope with the increased competition. The aim of the analysis is to explore the impact of foreign competition on the unpaid labor in the firm using the empirical specification in equation 3.1. I use unpaid workers as a proxy for family and network labor employed at the firm.^{3.14} The identification strategy depends on the changes in unpaid labor utilisation amongst firms that operate in industries facing different levels of foreign competition.

$$\begin{aligned} \text{Unpaid Labor Share}_{ipst} = & \alpha_i + \beta_1 \text{Penetration}_{st} + \beta_2 \text{Log External Wage}_{pst} + \\ & + \delta \Upsilon_{ipst} + \gamma_s + \vartheta_p + \theta_t + \epsilon_{ipst} \end{aligned} \quad (3.1)$$

where $\text{Unpaid Labor Share}_{ipst}$ measures the proportion of unpaid workers amongst all workers in firm i that operates in industry s in province p at time t and defined as:

$$\text{Unpaid Labor Share}_{ipst} = \left[\frac{\text{Unpaid Workers}_{ipst}}{\text{Total Labor}_{ipst}} \right] \quad (3.2)$$

^{3.14}See footnote 1 for justification.

where $\text{Unpaid Workers}_{ipst}$ is the total number of unpaid workers that work either full-time or part-time and $\text{Total Labor}_{ipst}$ is a total number of workers that are employed at the firm either full-time or part-time.

The main measure of foreign competition used in this chapter is the import penetration of Vietnamese manufacturing sector at the 4-digit ISIC level s at time t denoted by Penetration_{st} . This measures the share of the domestic market demand for a particular good that is satisfied by imports. I define it as a logarithm of imports divided by domestic industry revenue (see equation 3.3). A negative coefficient will imply that an increase in foreign competition is associated with fewer unpaid workers staying at the firm. My measure is similar to the measure used by Bloom and Van Reenen (2007), who defined import penetration as the logarithm of imports over home sales.^{3.15} I also use the logarithm of imports, Log Imports_{st} , to Vietnam at the 4-digit industry level as an alternative measure of foreign competition. I additionally include the logarithm of exports, Log Exports_{st} , from Vietnam to other countries.

$$\text{Penetration}_{st} = \text{Log} \left[\frac{\text{Imports}_{st}}{\text{Industry Revenues}_{st}} + 1 \right] \quad (3.3)$$

I also control for the external wage in the economy in order to control whether unpaid workers leave for better wages in other firms, $\text{Log External Wage}_{pst}$. Larger firms and firms that export enterprises are more likely to offer higher wages (Borjas and Ramey, 1995; Attanasio, Goldberg and Pavcnik, 2004; Fukase, 2013). For example, Macis and Schivardi (2016) showed that exporters pay a higher wage premium compared to other firms.

The vector Υ includes time variant basic firm characteristics. First, I use an indicator of self-reported competition. This is zero if a firm experiences no competition and one if a firm reported at least a “low level” of competition.^{3.16} This is used both to account for the level of competition perceived by the firm and as a robustness check. A recent paper by Nguyen and Nordman (2017) investigated differences in productivity for firms with family and hired labor using a sample of Vietnamese household firms. They found that the labor productivity gap for informal firms is around 35%. Also, informal firms are less likely to use formal employment methods (i.e. hiring through government programs) and thus might need to rely on family and network labor. I thus use an indicator of whether the enterprise has a tax code number, which acts as a proxy for whether the firm is formal.

I also include the logarithm of firm revenues to control for firm size. Longer established firms might use different hiring techniques adjusted over the years, thus I include the age of the firm in the specification. Unpaid labor is most likely to consist of family and relatives, which might be hired if the enterprise cannot find labor. I use an indicator for whether firms hired labor and whether they experienced difficulties in finding labor. Firms that highly rely on manual work are more dependent on labor than firms that use machinery and can replace workers with it. I thus control for the level

^{3.15}In place of home sales, I use sectoral revenues. Given that sectoral revenues might contain some export values, I test for the robustness of the results in section 3.A. I replace the denominator of Penetration with total industry revenues - exports.

^{3.16}This dummy variable was used intentionally due to concerns about the consistency of self-reported competition intensity. While fixed effects mean that only the relative ratings of a firm at different points in time would be important (i.e. no cross-firm comparisons) it is still likely that the way firms judge competitive intensity may change over time or a different manager/owner may answer the survey. By reducing this measure to this dummy format I only use whether or not competition occurs as this binary distinction is more likely to be readily apparent and consistent through time.

of technological advancement the firm has. I also include an indicator of whether the firm is an exporter. Vietnamese firms reported that finding an appropriate location for business is an issue partially because of poor infrastructure (Carlier and Tran, 2004). The quality of infrastructure can correlate with the performance of an enterprise and influence the labor composition. I account for it by using an indicator for whether an enterprise has access to a road or a rail.

The existing empirical literature established the importance of education in selection into entrepreneurship and performance (i.e. van der Sluis, van Praag and Vijverberg (2005) for the review of studies). In particular, more educated workers are more likely to work in wage employment and prefer non-farm entrepreneurship to farming. I control for the level of basic education of the survey respondent. A larger business network implies that firms can find workers easier and this can influence the decision to select a particular level of unpaid labor. I account for the social capital using the logarithm of the self-reported number of contacts inside and outside of the main line of business. Finally, I control the position of the respondent (either manager or owner).

The terms α_i represent firm fixed effects, γ_s account for differences in unpaid labor allocation between industries with industry indicator variables and θ_t controls for time component. ϑ_p is the set of dummies for provinces and ϵ_{ipst} is the statistical error term. I cluster standard errors at the three-digit industry level in order to take into account within industry autocorrelation and heteroskedasticity.

While Vietnamese trade liberalisation is considered as an exogenous shock,^{3.17} there are still potential confounders that could affect both the import competition and labor allocation (i.e. regulations that affect the growth of trade and labor demand, FDI could lead to more job creation and better international trade performance). To minimise the impact of endogeneity, I use firm fixed effects, time, province and industry indicators as well as an extensive set of controls. Another concern is that provinces can be disproportionately affected over time through both increased imports and increased hirings of outside labor. I account for this endogeneity concern by using a specification that includes province and time interactions in the robustness section.

3.4.2 Household labor at firms

The second approach restricts the sample to business owners and examines the effect of foreign competition on family labor responses. This identification strategy relies on exploiting variation in within-household employment choices in family firms, as the industries they operating are exposed to different levels of foreign competition. The following specification will be used:

$$\begin{aligned} \text{HHW Ratio}_{jpst} = & \lambda_j + \beta_1 \text{Penetration}_{st} + \beta_2 \text{Log External Wage}_{pst} + \\ & + \delta \Upsilon_{jpst} + \rho \Omega_{jpst} + \gamma_s + \vartheta_p + \theta_t + u_{jpst} \end{aligned} \quad (3.4)$$

where the dependent variable, HHW Ratio_{jpst} , measures the rate at which household workers leave the firm for other full or part time employment and it is defined as:

$$\text{HHW Ratio}_{jpst} = \left[\frac{\text{HHM Not Working at Firm}_{jpst}}{\text{HHM Working at Firm}_{jpst}} \right] \quad (3.5)$$

^{3.17}See discussion in section 3.2.

where HHM Working at Firm_{*jpst*} is the number of family members that are employed at the firm either full time or part-time. HHM Not Working at Firm_{*jpst*} is the total number of family members that work either full time, part time elsewhere or are self-employed outside of the household firm.

I use the same penetration measure as described earlier. A negative coefficient of penetration implies that an increase in foreign competition is associated with more family labor workers staying at the firm. I also use the same firm controls as described in section 3.4.1. The decision to use a particular level of family labor also depends on family size and composition, and I control for this with an additional vector of controls Ω_{jpst} . These controls are the number of household members by age group: less than 15 years old, between 15 and 60 years old and over 60 years old. A larger family size might indicate more support from the family and more involvement in the family business. Baines and Wheelock (1998) used a data from the UK and found that for more than 50% of a sample where the owner lived with a spouse, spouses were highly involved in the business in the form of co-ownership, paid or unpaid labor. At the same time, having more dependants in the family also suggests that households are subject to more risk than households with fewer dependents. Brand-Weiner and Francavilla (2015) showed that Vietnamese households with many dependents had low-income mobility.

The terms λ_j , γ_s and θ_t represent the respondent fixed effects as well as industry and time indicator variables respectively. ϑ_p controls for provinces and u_{jpst} is the statistical error term. I again cluster standard errors at three-digit industry level to account for within industry autocorrelation and heteroskedasticity.

I try to minimise the effect of endogenous factors that could affect both the level of foreign competition and the household firm labor composition by using household fixed effects, time, province, industry indicators and a set of controls. I also use province-time interactions in the robustness section to account for the possibility of endogeneity at time and province levels.

3.5 Results

This section presents the results of estimating equation 3.1 using the unbalanced sample of firms in section 3.5.1. In section 3.5.2 I restrict the unbalanced sample to firm owners and report the results of estimating equation 3.4. I also test for heterogeneous effects of foreign competition depending on the level of firm and household financial security.

3.5.1 Firm level analysis

I examine the effect of foreign competition using the penetration measure (defined in equation 3.3) on the share of unpaid labor at firms in Table 3.4. This shows a negative and statistically significant coefficient of penetration, which indicates that as import competition increases the firm tends to retain a smaller proportion of unpaid labor.^{3.18} I introduce the logarithm of the external wage in column (2) and add firm control variables in column (3). The coefficient of wage is negative, which

^{3.18}When the external wage is excluded from the regressions, the results remain robust.

suggests that higher wages available at other firms play a significant role in unpaid workers leaving the enterprise.^{3.19}

Table 3.4: The effect of foreign competition on unpaid labor allocation

	(1) Unpaid labor share	(2) Unpaid labor share	(3) Unpaid labor share
Penetration	-0.0532** (0.0256)	-0.0583* (0.0303)	-0.0962** (0.0418)
Competition		-0.0187** (0.00716)	-0.00894 (0.00571)
Log external wage		-0.0301 (0.0203)	-0.0319* (0.0180)
Wave 2 - before WTO	0.0197*** (0.00730)	0.0209*** (0.00727)	-0.00907 (0.0116)
Wave 3 - after WTO	0.00816 (0.00833)	0.0131* (0.00714)	-0.00325 (0.0129)
Wave 4 - after WTO	0.0232*** (0.00735)	0.0358*** (0.0130)	0.0165 (0.0143)
Wave 5 - after WTO	0.0331*** (0.0103)	0.0462*** (0.0116)	0.00256 (0.0190)
Constant	0.204 (0.151)	0.508* (0.268)	1.382*** (0.223)
Observations	8,891	8,888	8,668
R^2 (within)	0.0140	0.0155	0.131
Industry controls	Yes	Yes	Yes
Province controls	Yes	Yes	Yes
Firm controls	No	No	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Unbalanced sample. The dependent variable is unpaid labor share. Within R^2 are reported.

These results remain consistent when the logarithm of imports is used as an alternative foreign competition measure in Table 3.5.^{3.20} The logarithm of exports (a “pull” factor) is also controlled for. The negative coefficients for the logarithm of imports suggest that increases in import competition are associated with lower unpaid labor at firms. The increase in exports, which indicates an increase in opportunities in the industry for workers, leads to firms employing a higher share of unpaid workers. Together the results of tables 3.4 and 3.5 are consistent with an income diversification argument: as household firms face greater competition, more unpaid workers leave the firm to seek outside employment.

The income diversification mechanism implies that less financially stable firms would also exhibit a greater shift in response to foreign competition. This could be because these households have less wealth and are more sensitive to income changes than more financially stable firms. There may also be less incentive for family members to engage in unpaid work to bolster a lower earning

^{3.19}A concern can be raised that this specification does not take into account factors that vary by province and time and can potentially affect the results. In order to account for the possibility that some provinces can be disproportionately affected over time I use the specification with the combined province and time dummies in the robustness section.

^{3.20}When the external wage is excluded from the regressions, the results remain robust.

Table 3.5: The effect of imports and exports on unpaid labor allocation

	(1) Unpaid labor share	(2) Unpaid labor share	(3) Unpaid labor share
Log imports	-0.00785** (0.00302)	-0.00795** (0.00308)	-0.00812** (0.00358)
Log exports	0.00718** (0.00336)	0.00735** (0.00345)	0.00714* (0.00396)
Competition		-0.0191*** (0.00712)	-0.00867 (0.00564)
Log external wage		-0.0352* (0.0198)	-0.0346* (0.0176)
Wave 2 - before WTO	0.0197*** (0.00743)	0.0212*** (0.00728)	-0.00957 (0.0121)
Wave 3 - after WTO	0.00692 (0.00867)	0.0128* (0.00768)	-0.00421 (0.0135)
Wave 4 - after WTO	0.0239*** (0.00773)	0.0385*** (0.0130)	0.0178 (0.0145)
Wave 5 - after WTO	0.0304*** (0.00986)	0.0457*** (0.0117)	-0.000278 (0.0194)
Constant	0.217 (0.140)	0.569** (0.257)	1.411*** (0.216)
Observations	9,045	9,042	8,814
R^2 (within)	0.0214	0.0230	0.138
Province controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Firm controls	No	No	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Unbalanced sample. The dependent variable is unpaid labor share. Within R^2 are reported.

firm. I, therefore, replicate the empirical specification 3.1 for the samples below and above median profits, revenues and financial assets (table 3.6).^{3.21} The firms with profit, revenues and financial assets below the median exhibit larger coefficients and show a statistically significant response to penetration. The result for penetration is also statistically significant for the sample above median profit. However, the coefficient is about twenty times lower compared to the results for the sample below the median profit.

In total, the findings of the section are consistent with the income diversification hypothesis. I next test whether this result holds in specification focused on family workers leaving the firm at the household level rather than unpaid labor at the firm level.

3.5.2 Household level analysis

This section tests whether an increase of foreign competition affects the ratio of household members leaving the household firm for other wage employment. I limit the sample to business owners responses, so I can explore the internal variation within a household over time. Table 3.7^{3.22} presents the results that rely on the empirical specification defined in equation 3.4. Positive and statistically significant coefficients for penetration across all specifications suggest that as foreign competition increases family workers leave the firm for other employment. These results further show that the external wage available in other industries is an important factor in the decision to leave the firm.

If the income diversification mechanism is present, then the effect of heightening foreign competition would be more pronounced in households that highly depend on the firm as their main income source. Thus, I interact penetration with the categories representing the number of income generation jobs a household has. The baseline category is one income generating job in a household. The results are available in the last column of table 3.7. The effect of penetration is still statistically significant. As the household has more income generating jobs, the effect of foreign competition is lower. This suggests that the results of the paper are mainly driven by less financially stable households.

This section further confirmed the results which are consistent with the income diversification mechanism, where household members leave the firm to find a job elsewhere as foreign competition increases.

3.6 Robustness

To check robustness, I first use different penetration measures (the results are in Table 3.8). Penetration (1) follows the method used by Nickell (1996) and is the ratio of imports over domestic sales. The second measure, Penetration (2), is similar to the utilised by Konings, Cayseele and Warzynski (2005). This is the share of imports over the total of imports and domestic sales. Finally, Penetration (3) is the logarithm of the share of imports over the difference between domestic

^{3.21}When the external wage is excluded from the regressions, the results remain robust.

^{3.22}When the external wage is excluded from the regressions, the results remain robust.

Table 3.6: The effect of foreign competition on unpaid labor allocation depending on firms' financial performance

	(1) Below median profit	(2) Above median profit	(3) Below median revenue	(4) Above median revenue	(5) Below median fin. assets	(6) Above median fin. assets
Penetration	-0.365*** (0.0836)	-0.0841** (0.0410)	-0.454** (0.184)	0.00752 (0.0351)	-0.160* (0.0834)	-0.0503 (0.0786)
Competition	-0.0149* (0.00874)	0.00505 (0.0123)	-0.0144*** (0.00510)	0.00383 (0.0126)	-0.0103 (0.00642)	-0.0142 (0.0103)
Log external wage	0.0284 (0.0245)	-0.0536* (0.0284)	-0.0174 (0.0231)	-0.0499* (0.0264)	-0.0193 (0.0305)	-0.0308 (0.0208)
Observations	4,365	4,187	4,356	4,196	4,369	4,183
R^2 (within)	0.156	0.0952	0.183	0.0679	0.148	0.0952
Time controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Province controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Unbalanced sample. The dependent variable is unpaid labor share. Within R^2 are reported. Above implies - greater or equal ($\geq$) to median profit, revenue or financial assets.

Table 3.7: The effect of foreign competition on household labor allocation

	(1) HHW ratio	(2) HHW ratio	(3) HHW ratio	(4) HHW ratio	(5) HHW ratio
Penetration	0.509*** (0.101)	0.578*** (0.139)	0.546*** (0.129)	0.535*** (0.110)	0.648*** (0.113)
Competition		0.0951*** (0.0303)	0.108*** (0.0334)	0.103*** (0.0300)	0.101*** (0.0284)
Log external wage		0.380*** (0.0749)	0.371*** (0.0828)	0.322*** (0.0761)	0.308*** (0.0759)
Wave 2 - before WTO	-0.0101 (0.0350)	-0.0278 (0.0317)	0.00194 (0.0402)	0.0158 (0.0511)	0.0196 (0.0517)
Wave 3 - after WTO	0.224*** (0.0354)	0.156*** (0.0319)	0.194*** (0.0596)	0.219*** (0.0696)	0.233*** (0.0699)
Wave 4 - after WTO	0.206*** (0.0370)	0.0405 (0.0433)	0.0839 (0.0649)	0.128* (0.0685)	0.172** (0.0686)
Wave 5 - after WTO	0.200*** (0.0373)	0.0328 (0.0460)	0.0408 (0.0772)	0.0966 (0.0809)	0.141* (0.0805)
Two income jobs					0.246*** (0.0271)
Over three income jobs					0.446*** (0.0972)
Two income jobs × Penetration					-0.534** (0.215)
Over three income jobs × Penetration					-1.213 (2.315)
Constant	0.493*** (0.147)	-3.281*** (0.786)	-2.811*** (0.842)	-2.868*** (0.797)	-2.905*** (0.818)
Observations	7,466	7,463	7,328	7,327	7,327
R^2 (within)	0.0409	0.0464	0.0536	0.127	0.143
Industry controls	Yes	Yes	Yes	Yes	Yes
Province controls	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes
Household controls	No	No	No	Yes	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Unbalanced sample. The dependent variable is household working ratio. Within R^2 are reported.

sales and exports. This measure is similar to the main penetration measure used in this chapter. However, given that I use sectoral revenues as a proxy for domestic sales, these might contain some revenues from exports. Therefore in penetration (3), I subtract the exports from the industry level revenues. The results in Table 3.8 are consistent with the findings presented in the previous section for both measures of family and network labor across all specifications.

I further replace the unpaid labor share with a ratio of unpaid over paid labor in Table 3.9. This measures the replacement ratio of unpaid workers with paid employees. The results imply that increases in the foreign competition are associated with lower unpaid labor remaining at the firm compared to paid employees.

Previous studies have found that severe competition might drive firms out of their main business activity and make them choose to produce different products (i.e. Newman, Rand and Tarp (2013) for Vietnam). If a firm decided to switch industry, then it might be a logical time to adjust staffing. The model of Melitz (2003) predicted that unproductive firms exit the market in response to trade liberalisation. The firms that exit might have a different family hiring composition compared to the firms that survived. I explore whether the firms that exit, enter the market and switch the industry had different hiring family hiring approaches in response to foreign competition. I, therefore, interact both measures of foreign competition with an indicator variable for whether the firm entered the market, exited the market or switched the industry since previous wave in Table 3.10. The coefficients for penetration and imports exhibited a negative sign and are statistically significant as in the previous section, however, the interaction terms for exit, entry and switchers are not statistically significant. This suggests that competition drives changes in labor utilisation independent of switching, entry or exit.

The robustness of the results to the balanced sample is then tested in Table 3.11. I use the empirical specifications 3.1 and 3.4. All of the results remain robust. Finally, I examine whether the potential for endogeneity at the provincial and time level potentially bias the results. Vietnam's growth and WTO accession could have attracted more imports, exports and FDI into particular provinces. At the same time, household members of the firms operating in these expanding provinces could have left the family firm. The external wage may not be able to perfectly control for the change in the opportunities available at other firms in this case. To avert this, I use combined time and province dummies to control for the factors that vary at both time and province levels in Table 3.12. Although the magnitude of coefficients declined slightly, the results are consistent with the previous section highlighting that household and network labor leaves the firm in response to foreign competition.

Table 3.8: The effect of foreign competition on household labor allocation (with alternative penetration measures)

	(1) Unpaid labor share	(2) Unpaid labor share	(3) Unpaid labor share	(4) HHW ratio	(5) HHW ratio	(6) HHW ratio
Penetration (1)	-0.0667** (0.0263)			0.368*** (0.102)		
Penetration (2)		-0.130** (0.0605)			0.709*** (0.147)	
Penetration (3)			-0.0852** (0.0352)			0.486*** (0.134)
Competition	-0.00895 (0.00572)	-0.00893 (0.00571)	-0.00895 (0.00571)	0.104*** (0.0292)	0.104*** (0.0292)	0.110*** (0.0327)
Log external wage	-0.0318* (0.0180)	-0.0319* (0.0181)	-0.0318* (0.0181)	0.327*** (0.0745)	0.327*** (0.0747)	0.382*** (0.0794)
Constant	1.381*** (0.223)	1.382*** (0.223)	1.381*** (0.223)	-3.980*** (1.183)	-3.990*** (1.188)	-3.984*** (1.187)
Observations	8,668	8,668	8,668	7,330	7,330	7,331
R^2 (within)	0.131	0.131	0.131	0.127	0.127	0.0531
Time controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Province controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	No	No	No	Yes	Yes	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Unbalanced sample. Within R^2 are reported.

Table 3.9: Unpaid workers, competition and wages with alternative dependent variable

	(1) Unpaid replacement	(2) Unpaid replacement
Penetration	-0.242* (0.125)	
Log imports		-0.0135*** (0.00478)
Log exports		0.0128*** (0.00476)
Competition	0.0150 (0.0183)	0.00758 (0.0192)
Log external wage	-0.253*** (0.0738)	-0.254*** (0.0723)
Constant	2.981*** (0.724)	3.021*** (0.722)
Observations	8,668	8,814
R^2 (within)	0.0284	0.0310
Time controls	Yes	Yes
Industry controls	Yes	Yes
Province controls	Yes	Yes
Firm controls	Yes	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Unbalanced sample. The dependent variable is unpaid labor share. Within R^2 are reported.

Table 3.10: The effect of foreign competition on unpaid labor allocation for entering, switching and exiting firms

	(1) Unpaid labor share	(2) Unpaid labor share	(3) Unpaid labor share	(4) Unpaid labor share	(5) Unpaid labor share	(6) Unpaid labor share
Penetration	-0.103** (0.0451)	-0.110** (0.0447)	-0.0869* (0.0440)			
Entry	-0.00685 (0.0129)			0.0134 (0.0218)		
Entry × Penetration	0.0896 (0.0728)					
Switcher		-0.0101 (0.0101)			-0.0116 (0.00950)	
Switcher × Penetration		0.0547 (0.0829)				
Exit			0.00269 (0.0119)			0.00356 (0.0227)
Exit × Penetration			-0.0842 (0.0599)			
Ln imports				-0.00799** (0.00360)	-0.00850** (0.00355)	-0.00810** (0.00358)
Entry × Ln imports				-0.00200 (0.00228)		
Switcher × Ln imports					0.000242 (0.000788)	
Exit × Ln imports						-0.000336 (0.00172)
Ln exports				0.00710* (0.00396)	0.00730* (0.00398)	0.00715* (0.00394)
Observations	8,668	8,814	8,668	8,814	8,668	8,814
R^2 (within)	0.131	0.139	0.132	0.139	0.131	0.138
Time controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Province controls	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Unbalanced sample. The dependent variable is unpaid labor share. Within R^2 are reported.

Table 3.11: The effect of foreign competition on unpaid and household labor allocation for balanced sample

	(1) Unpaid labor share	(2) HHW ratio
Penetration	-0.102** (0.0465)	0.701*** (0.145)
Competition	-0.0111 (0.00814)	0.101** (0.0469)
Log external wage	-0.0420** (0.0185)	0.472*** (0.155)
Observations	4,384	3,213
R^2 (within)	0.134	0.131
Time controls	Yes	Yes
Industry controls	Yes	Yes
Province controls	Yes	Yes
Firm controls	Yes	Yes
Household controls	No	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Balanced sample. Within R^2 are reported.

Table 3.12: The effect of foreign competition on unpaid labor allocation (with time $\times$ province controls)

	(1) Unpaid labor share	(2) HHW ratio
Penetration	-0.0651** (0.0261)	0.354*** (0.0995)
Competition	-0.0121** (0.00556)	0.0782** (0.0364)
Log external wage	-0.0511 (0.0306)	0.284** (0.134)
Constant	1.530*** (0.327)	-2.498* (1.349)
Observations	8,668	7,330
R^2 (within)	0.145	0.130
Time $\times$ Province controls	Yes	Yes
Industry controls	Yes	Yes
Firm controls	Yes	Yes
Household controls	No	Yes

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at three digit industry level. Unbalanced sample. The dependent variable is unpaid labor share. Within R^2 are reported.

3.7 Conclusion

Household businesses employ a significant proportion of the workforce in developing countries and as such the reallocation of workers from unpaid labor roles in household firms to other roles is important to understand. As a result, the impact of international trade on the performance of firms in developing countries and the related employment outcomes has been an area of intense research (Hoekman, 2005; Menezes-Filho and Muendler, 2011; McCaig and Pavcnik, 2014, 2018).

This chapter contributes to this literature and is focused on the impact of import competition for household firms on the labor supply decisions of these households. A large panel dataset of household manufacturing firms operating in Vietnam was used to identify these relationships. In this analysis, I found that unpaid labor at household firms are more likely to leave the firm as the level of foreign competition in the industry increases. The results are mainly driven by less financially stable firms. The results are reduced but still statistically significant when the external wages are controlled for. The findings are consistent with an income diversification mechanism on the part of households: family workers leave family firms to diversify the households income source away from the household firm as a result of increased uncertainty about the firm's future. The empirical results are robust to a number of alternate specifications.

This chapter finds how foreign competition affects the employment structure in small firms. Given that a large share of workers in developing economies are still employed at household firms, this finding has implications for understanding how workers and firms are affected by increased economic integration. One key implication is this chapter's finding that poorer households are more likely to change employment patterns than wealthier households.

Appendices

3.A Tables

Table 3.A.1: The number of firms that entered, exited the market and switched industries

	2005	2007	2009	2011	2013
Entered	-	208	258	277	256
Switched	-	1,017	1,143	1,348	1,216
Exited	343	301	324	291	-

Table 3.A.2: T-tests analysis: entering, exiting and industry switching firms

Panel A: Entering and non-entering firms									
	Firm entrant no obs.	Firm entrant mean	Firm entrant SD	Firm non-entrant no obs.	Firm non-entrant mean	Firm non-entrant SD	P-value		
Unpaid labor share	998	0.542	0.341	8, 053	0.500	0.350	***		
Unpaid labor	998	1.921	0.940	8, 053	1.909	1.091	***		
Total labor	999	5.569	6.287	8, 054	7.212	12.520	***		
HHW ratio	997	0.636	0.891	8, 032	0.624	0.886	***		
Hiring Issues	416	0.260	0.439	3, 967	0.200	0.400	***		
Network hiring	647	0.921	0.270	5, 670	0.884	0.320	***		
Hired to hired ratio	998	-0.051	0.151	8, 024	-0.062	0.214	***		
Labor hired	998	0.466	1.677	8, 055	0.719	4.029	***		
Labor fired	999	0.052	0.549	8, 025	0.078	0.630			
Labor left	999	0.425	2.780	8, 025	0.518	1.857			
Revenue	999	987, 603	3, 267, 876	8, 053	1, 160, 106	3, 917, 030	***		
Profit	999	161, 644	319, 985	8, 052	199, 678	673, 442	***		
Financial assets	999	115, 330	240, 228	8, 053	178, 104	902, 155	***		
Physical assets	999	1, 422, 303	4, 203, 884	8, 053	1, 680, 209	4, 599, 510	*		
Panel B: Switcher and non-switcher firms									
	Firm switcher no obs.	Firm switcher mean	Firm switcher SD	Firm non-switcher no obs.	Firm non-switcher mean	Firm non-switcher SD	P-value		
Unpaid labor share	4, 723	0.515	0.349	4, 328	0.493	0.349	***		
Unpaid labor	4, 723	1.911	1.066	4, 328	1.909	1.086	***		
Total labor	4, 724	6.921	10.828	4, 329	7.149	13.167	***		
HHW ratio	4, 708	0.668	0.910	4, 321	0.580	0.857	***		
Hiring Issues	2, 246	0.224	0.417	2, 137	0.186	0.389	***		
Hired to hired ratio	4, 724	-0.059	0.230	4, 298	-0.064	0.180			
Labor hired	4, 724	0.598	2.101	4, 329	0.793	5.102	**		
Labor fired	4, 724	0.084	0.615	4, 300	0.065	0.629			
Labor left	4, 723	0.489	1.611	4, 329	0.528	2.319			
Revenue	4, 723	1, 171, 123	4, 338, 928	4, 328	1, 108, 278	3, 235, 955	*		
Profit	4, 723	207, 155	725, 617	4, 328	182, 740	541, 170			
Financial assets	4, 723	182, 744	1, 024, 451	4, 329	158, 556	618, 832			
Physical assets	4, 723	1, 837, 327	5, 143, 464	4, 329	1, 449, 274	3, 808, 577	***		
Panel C:Exited the market and survived firms									
	Firm exits no obs.	Firm exits mean	Firm exits SD	Firm survivor no obs.	Firm survivor mean	Firm survivor SD	P-value		
Unpaid labor share	1, 259	0.465	0.339	7, 792	0.511	0.351	***		
Unpaid labor	1, 259	1.797	1.019	7, 792	1.928	1.083	***		
Total labor	1, 259	7.632	16.519	7, 794	6.933	11.101	***		
HHW ratio	1, 255	0.696	0.970	7, 774	0.614	0.871	***		
Hiring Issues	669	0.197	0.398	3, 714	0.207	0.405			
Hired to hired ratio	1, 253	-0.071	0.237	7, 769	-0.060	0.203			
Labor hired	1, 259	0.922	5.024	7, 794	0.654	3.613	*		
Labor fired	1, 253	0.096	0.737	7, 771	0.072	0.601			
Labor left	1, 253	0.709	2.891	7, 771	0.475	1.788	***		
Revenue	1, 259	1, 232, 378	4, 670, 640	7, 793	1, 126, 316	3, 701, 719			
Profit	1, 259	210, 274	729, 238	7, 792	193, 090	629, 311			
Financial assets	1, 259	161, 482	510, 953	7, 793	172, 743	898, 173			
Physical assets	1, 259	1, 785, 667	4, 869, 598	7, 793	1, 630, 110	4, 505, 633			

Source: Authors' calculations based on Vietnamese Small and Medium Enterprise Surveys. Significance is denoted by: * 10% level, ** 5% level, *** 1% level.

Chapter 4

It's good to be bad: a model of low quality dominance in a consumer search market (with Stuart Baumann)*

4.1 Introduction

When a consumer is faced by a good with observable price but unobservable quality they will often use price to infer quality. This has been noted by economists at least as far back as Scitovszky (1944) who noted that consumers generally perceive high price to signify high quality. The advent of signalling theory spurred further growth in this area as economists started to model firms using price signalling in order to signal high quality (for instance Bagwell and Riordan (1991)).

Less attention has been paid to the reverse information state, however - where consumers have a perception of the quality of a good, but not know the price at which it is being offered. This information state frequently occurs in consumer search markets. Variety stores and department stores are examples where consumers may know the quality generally offered by the store but not the price of the particular item sought. Another example is in the market for lawyers where consumers may be able to infer quality from the reputation of a law firm, but not the rate that the lawyer will charge for their case.

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In these cases, consumers may use the quality of a good to infer the price that will be offered by the selling firm. There is substantial evidence for this occurring in the marketing and the management literature. Brown (1969), Baker et al. (2002) and Hamilton and Chernev (2013) use survey and experimental evidence to find that consumers expect that stores with a high level of quality will also have high prices. These price perceptions are often a problem for retailers as there is evidence that they are a strong influence on what shops a consumer will choose to visit (Alba and Marmorstein, 1987). More recently Heda, Mewborn and Caine (2017) discuss a Bain & Company research survey of eight United States grocery chains and several thousand consumers. One of these chains had the problem that its reputation as an upscale retailer gave consumers the perception that it charged a price premium. This was despite this retailer's price actually being in line with the competition. The authors' advice for retailers in this situation is to tailor their marketing strategy to influence consumers perception of their price. Thus if a discount supermarket wants to be recognised as being low price, they might emphasise their lower quality private-label goods in their marketing strategy. This implication seems to fit with the marketing strategies of many discount stores that specialise in selling "factory seconds" such as Australia's "Reject Shop". These stores can often be seen airing advertisements with phrases that are vague but suggestive of low quality such as "like new", "discontinued", "second-hand" or "refurbished".

This sort of marketing also seems to exist in the United States legal services industry where many lawyers advertise in undignified ways. The United States has at least three attorneys that call themselves "the hammer" in their advertisements (AboveTheLaw.com, 2012). This kind of advertising is strongly discouraged by the American Bar Association who warn that "*lawyers should consider that the use of inappropriately dramatic music, unseemly slogans, hawkish spokespersons, premium offers, slapstick routines or outlandish settings in advertising does not instil confidence in the lawyer or the legal profession*" (American Bar Association, 2016), a view that finds support in the marketing literature (Trebbi, Hayes and Walker, 1999).^{4.1} It has been argued that this kind of advertising plays an informational role however for consumers (Durrani, 2011). A consumer may have a simple issue where there is not much marginal benefit from employing a better than average lawyer. Tacky advertising can signify a basic standard of legal service and hence a low price to these consumers.

This chapter models consumers inferring price from quality in a consumer search setting. It is shown that, where consumers infer price from quality in a market with search frictions, there exists an unravelling effect that leads low quality firms to dominate the market. To see this effect consider there exists a high quality firm and a low quality firm and these qualities are known to consumers. Consumers have heterogeneous marginal utility from quality (that we call "taste") and can choose what firm to go to upon entering the market. Considering a putative equilibrium where high taste consumers go to the high quality firm, and low taste consumers go to the low quality firm, the high quality firm will price to make one of the consumers approaching it indifferent to buying and searching at the low quality firm. The diamond paradox applies to this marginal consumer, and he makes no surplus. When a consumer can anticipate, however, that when he arrives at a high quality firm he will be this marginal consumer, then that consumer would be better off (by the extent of the search cost) going to the low quality firm ex-ante, where there will be some lower taste consumer who will be made indifferent to buying and taking their outside option. This will result in fewer and higher taste consumers visiting the high quality firm which

^{4.1}In addition the American Bar Association had previously banned all lawyer advertising in 1907, however, this ban was overturned by the supreme court in 1977 on freedom of speech grounds (US Supreme Court, 1977).

will result in this firm raising its prices to make a higher taste consumer indifferent to buying and searching at the low quality firm. This new marginal consumer will again be better off going to the low quality firm ex-ante. Through this mechanism, we get an unraveling result where the sole refined equilibrium is one where all consumers go to a low quality firm, and no consumers will visit a high quality firm.

In short, low quality firms attract consumers with a low marginal utility from quality and a corresponding low willingness to pay. As all consumers prefer to shop alongside consumers with a lower willingness to pay (due to the effect on the price the firm will offer), this leads to the unraveling mechanism that leads a low quality firm to dominate the market. This raises the question of whether this unravelling effect may encourage low quality firms to disclose that they are low quality. We examine this in our first extension to find that in certain settings it can be beneficial for low quality firms to disclose their quality. Another question that emerges is whether a high quality firm may be able to avert this equilibrium by stocking the low quality good along with the high quality good. In an extension to the model, we find that this is not the case. A firm selling both goods has a monopoly screening problem - if they price the low quality good at too low a level, they will cannibalize sales of the higher priced high quality good. On the other hand, a firm selling only the low quality good has no such problem and will offer a lower price for the low quality good. Thus in this extension, lower taste consumers will visit the firm only offering the low quality good, and the same unraveling will result. In another extension, we also consider firms endogenously choosing the quality levels of their goods. We find that the unraveling effect can result in firms choosing lower quality levels as there is a benefit in being the lowest quality firm in the market.

A key implication of this chapter is that being perceived as low quality can provide an advantage for a firm in a search setting. This is because consumers can rationally expect a low price and are more hence likely to visit the firm.^{4.2} In the model presented this has the result that low quality firms can actually benefit overall from disclosing their low quality to consumers. A further contribution is that the model presented has an interesting contrast with Akerlof (1970). Whilst in a standard lemons model asymmetric information causes markets to unravel with only low quality goods remaining, in this chapter the opposite result is shown with unraveling only occurring when quality is known to consumers. Clearly search frictions are key to this result, however, the only crucial assumptions over that of a standard consumer search model are that consumers can choose what firm to go to upon entering the market and that consumers have heterogeneous marginal utility from quality.

An important insight of the model is that quality information can adversely impact search market efficiency, by resulting in the suboptimal equilibrium where all consumers visit the low quality firm. In addition, search frictions can encourage firms to decrease the quality of their good offerings even when it is costless to produce a higher quality good. To avert these outcomes, it may thus be desirable to implement minimum quality standards in markets exhibiting search frictions. This chapter thus provides an argument in support of restrictions on advertising that prevents sellers from presenting a low quality image, for instance, the historical restrictions on legal advertising in

^{4.2}A key assumption is that firms cannot commit to prices before consumers visit them. This is a normal assumption in search markets and fits well the examples we have presented. Large retail stores that sell many varieties of goods will find it difficult to commit to prices for more than a small fraction of the goods they sell. Lawyers will often find it difficult to estimate their price for a case without first discussing the case with the consumer.

the United States.

The effect of quality expectations on price expectations has not been extensively studied in the economics literature. While the marketing literature suggests that consumers expect high quality firms to post high prices and may avoid them as a result (Brown, 1969; Baker et al., 2002; Hamilton and Chernev, 2013), this has not to our knowledge been modelled in a consumer search setting. There does exist a small literature examining vertically differentiated consumer search markets. Wildenbeest (2011) considers a search market with an equilibrium exhibiting search and price dispersion similar in nature to that of Varian (1980). Wildenbeest's model does not succumb to the unravelling result presented in this chapter as a result of assuming consumers with equal preferences regarding quality and consumers entering the market exogenously. Consumers with different marginal utilities from quality are incorporated in the paper of Galenianos and Gavazza (2017) model of the market for illicit drugs. This paper models drugs as experience goods with quality being unobservable until the drug is consumed. Thus in this model, it is not possible for consumers to seek out a high or low quality seller in search and no unravelling occurs. On the note of firm disclosure of quality information, there is an extensive economics literature examining these decisions in markets where consumers cannot directly observe quality. Many early papers conclude that an unraveling result will prevail in such markets (Grossman, 1981; Milgrom, 1981). This occurs from the highest quality firm in a putative pooling equilibria wanting to differentiate itself which lowers the expected value of the remaining pool, leading to the next highest quality firm wanting to differentiate itself from the pool and so on. That mandatory disclosure laws are thought necessary in the face of this unraveling result presents somewhat of a puzzle, and so later papers look at where this result can fail (Dranove and Zhe Jin, 2010).

A number of papers have considered the effect of quality disclosure decisions on price competition (Board, 2009; Levin, Peck and Ye, 2009). Generally, these papers find that firms can refrain from disclosing quality in order to disincentive competitors to setting a low price. There have also been papers that have tried to include signalling and disclosure decisions in a unified framework. Daughety and Reinganum (2008) create a unified model where firms choose between disclosure and signalling. They find that when disclosure is costless, all firms will disclose but if disclosure is sufficiently costly firms may signal. Another paper to include signalling and disclosure is that of Caldieraro, Shin and Stivers (2011). Interestingly this paper shows cases where it can be optimal for low quality firms to disclose their quality. Their model includes the possibility of high quality firms signalling their quality by depressing their price which intensifies price competition with the low quality firms. Both high and low quality firms can avert this by disclosure which acts to increase the proportion of consumers that can recognise quality. By informing these consumers the incentives for high quality firms to depress their price for signalling are eroded, and both firms are better off while consumer surplus is reduced.

A recent paper to look at the choice between disclosure and signalling in a duopolistic market is that of Jansson and Roy (2015). They examine firms that can be high or low quality (defined by an exogenous probability) where firms interact in a two stage game. In the first stage, each firm can credibly disclose their quality to the market whilst in the second stage each firm offers a consumer a price. The consumer then buys from the firm that offers the higher utility after taking into account perceived quality and price. They find equilibria where firms with high quality goods decide to signal rather than disclose due to the strategic effects of disclosure on the other firm's price. When firms price without knowing the quality of their competitor, price competition is less

intense. Thus the effects of price competition deter disclosure.

This chapter seeks to build upon the literature in a few respects. Whilst Jansson and Roy (2015) offer a mechanism where high quality firms are deterred from disclosure even when it is costless, their mechanism relies on market power and hence would not generalise to markets where there are many firms. On the other hand, the mechanism presented in this chapter relies on search frictions and hence may be more generalisable to such markets.^{4.3} A second contribution is that in our model, low quality firms proactively disclose that their goods are of low quality. Whilst this possibility has been examined by Caldieraro, Shin and Stivers (2011) two points of difference should be drawn. Caldieraro, Shin and Stivers (2011) present a model where it is beneficial for *all* firms to disclose quality while this chapter presents a case where only low quality firms would like to disclose, and this disclosure harms high quality firms. Finally, the mechanism for low quality firms to disclose in Caldieraro, Shin and Stivers (2011) requires firms to signal high quality by *reducing* their price. While this is supported in their model, most evidence in the economics and marketing literatures suggests that consumers generally perceive high price to signal high quality. This chapter, on the other hand, presents a rationale for low quality firm disclosure that stems from search fractions and thus may better describe some markets.

4.2 The model

There are two firms in a market, one of which sells a product of quality H (the “high firm”) and one of which sells a good with a lower quality of L (the “low firm”). Both firms produce their goods costlessly. There is a unit measure of consumers. Consumers have heterogeneous marginal utility from quality described by a “taste” parameter. A consumer with a taste parameter of a_i , with an offer for a good with an quality of Q and a price of P gets an expected utility from purchase of:

$$a_i Q - P \tag{4.1}$$

The taste parameter is uniformly distributed on $[0, 1]$ with a cdf given by:^{4.4}

$$\text{Prob}[a_i < x] = x \quad \text{for} \quad x \in [0, 1] \tag{4.2}$$

All consumers know the quality offered by the two firms. A fraction $1 - \psi$ of “*directed*” consumers (orthogonal to taste) can choose to approach either the low or high quality firm upon entering the market. The complementary fraction, ψ , of consumers are “*undirected*” and approach either firm with 50% probability. Upon entering the market undirected and directed consumers are identical.

The timing is as follows. Both firms simultaneously choose a price that they will offer to all consumers that will approach them with no price discrimination possible. Firms cannot alter this

^{4.3}Whilst for simplicity the baseline model of this chapter analyses the case of two firms, in an extension (section 4.4.3) it is shown that the result where low quality firms benefit from full information extends to the setting of many firms.

^{4.4}The simple form of the utility from consumption $a_i Q - P$ and the uniform distribution of taste parameters are useful for tractability reasons, however the central unraveling mechanism (Proposition 1) extends to other taste distributions (including discrete distributions and distributions exhibiting gaps) and utility function forms, u , exhibiting $\frac{\partial u}{\partial a} > 0$, $\frac{\partial u}{\partial Q} > 0$, $\frac{\partial^2 u}{\partial a \partial Q} > 0$.

price throughout the game. Consumers then proceed to approach one of the two firms. Consumers can then decide to buy, search at the other firm incurring a search cost of s or leave the market to get an exogenous outside option of value 0. We assume $L > 0$ and thus a low quality firm recognised as being low quality will still be able to make some sales if visited by consumers with sufficiently high taste. We adopt the indifference rule that where $a_i Q - P_Q < 0$ for both firms for a consumer with taste a_i that consumer will approach the firm with a higher value of $a_i Q - P_Q$.

We assume that all consumers enter the market costlessly.^{4.5} Consumers face a search cost for visiting the other firm once they are in the market, however. We assume that this search cost is strictly nonzero and positive but sufficiently small such that the best alternative to buying for the marginal consumer at the high firm is to buy from the low firm. This assumption depends on equilibrium pricing decisions and thus will be formalised later on.^{4.6} The possible search paths open to consumers are summarised in figure 4.1.

Note that, the mass of undirected consumers ensures that each firm is always approached by a positive mass of consumers. This ensures that in the putative equilibrium where all consumers visit one of the firms the beliefs of the other firm regarding the taste of deviating consumers visiting them out of equilibrium do not need to be established. The methodology of analysing this game will be to first examine the Perfect Bayesian Equilibrium (PBEs) at any given level of ψ . Of particular interest is the state of the market when ψ is small and we shall call a PBE “refined” when it is the limit of a sequence of PBEs as $\psi \rightarrow 0$.^{4.7}

These equilibrium concepts can be formally described as:

Definition 1 (Equilibrium Concepts). *A Perfect Bayesian Equilibrium (PBE) in this game is defined as a pricing and strategy for firms, a search strategy for consumers and quality beliefs of consumers such that no consumers or firms have a profitable deviation and all beliefs are supported by Bayes rule in equilibrium.*

A Refined Perfect Bayesian Equilibrium (RPBE) is the limit of a sequence of PBEs as $\psi \rightarrow 0$.

4.2.1 Solving for equilibrium

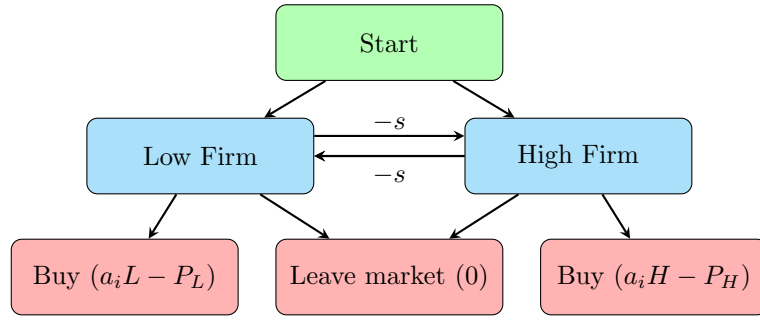
We open our analysis of the game with a lemma and a corollary that help to narrow the range of putative equilibria considerably:

Lemma 1. *When $\hat{a} > a_*$ and $H > L$ there will not exist any equilibrium where a taste a_* directed*

^{4.5}One justification is that consumers may benefit from the experience of visiting a single firm but get bored thereafter. For instance the first test-ride of car at a dealership may be enjoyable whilst the process of looking for similar cars at other dealerships may be dull. To take an alternate example in the legal services market, a consumer facing criminal charges may benefit from hearing one lawyer's opinion on their case (while that lawyer provides a quote) but gets no additional information from visiting other lawyers (and getting other quotes). An alternate justification of this assumption may include undirected consumers randomly running into shops as they go about their normal day while directed consumers may be those able to plan their movements to choose what stores they run into. For instance a directed consumer intending to visit a beach may choose to go to one near a low/high quality shopping centre in order to visit a low/high quality firm at the same time. In this setting an undirected consumer is one that lives near only one beach so they cannot choose what firm to visit for free.

^{4.6}This is done on page 64 just before lemma 3.

^{4.7}This terminology is because the refined equilibrium we present can be interpreted as a trembling hand refinement (Selten, 1975) of an equilibrium without undirected consumers, with the start of search strategy being trembled.

Figure 4.1: Consumer search paths for a consumer with taste a_i

consumer goes to the firm with expected quality H whilst a taste $\hat{a}$ directed consumer goes to a firm with expected quality L .

Proof. In the a space the utility from each good is linear and given by $aL - P_L$ and $aH - P_H$. This implies a single crossing condition that ensures that all consumers with a taste above the intercept point will approach the high firm and all consumers with a lower taste will approach the low firm. The assumed indifference rule ensures this holds in the case of low taste consumers where both $aL - P_L$ and $aH - P_H$ are less than 0. $\square$

Corollary 2. *In any equilibrium, the set of directed consumers that choose to visit firms of a particular quality level will be convex in the “taste” dimension. We will denote the ex-ante indifferent consumer’s taste as $a_A = \frac{P_H^E - P_L^E}{H - L}$, hence $[0, a_A]$ consumers will visit the low firm and $[a_A, 1]$ consumers will approach the high firm.*

Proof. The ex-ante indifferent consumer has equal expected utility from either firm and thus:

$$a_A H - P_H^E = a_A L - P_L^E \quad (4.3)$$

$$a_A = \frac{P_H^E - P_L^E}{H - L} \quad (4.4)$$

$\square$

By setting up expressions analogous to equation 4.3 and rearranging, we can derive expressions for the indifferent taste consumers at each firm. These can be seen in table 4.1:^{4.8}

^{4.8}It should be noted that at the high firm consumers use their expectation of P_L and at the low firm consumers use their expectation of P_H . Before directed consumers enter the market they use their expectations of both prices. As pricing is simultaneous, each firm prices using an expectation of the other firm’s price.

Notation	Location of consumer	Indifferent between	Formula
a_H	High firm	Buying and going to low firm	$\frac{P_H - P_L^E - s}{H - L}$
a_{HL}	High firm	Buying and leaving market	$\frac{P_H}{H}$
a_{HLM}	High firm	Going to low firm and leaving market	$\frac{P_L^E + s}{L}$
a_L	Low firm	Buying and leaving market	$\frac{P_L}{L}$
a_T	Low firm	Buying and going to high firm	$\frac{P_H^E - P_L + s}{H - L}$

Table 4.1: Indifferent consumers

These can be used to write the demand function of the high firm:^{4.9}

$$\begin{aligned}
Q_{\text{High}}(P_H) = & \overbrace{\frac{\psi}{2} [1 - \max(a_{HL}(P_H), a_H(P_H))]_+}^{\text{Undirected - own}} + \overbrace{\frac{\psi}{2} \left[1 - \max\left(a_A + \frac{s}{H - L}, a_{HL}(P_H), a_H(P_H)\right) \right]_+}^{\text{Undirected runoff from the } L \text{ firm}} \\
& + \overbrace{(1 - \psi) [1 - \max(a_A, a_{HL}(P_H), a_H(P_H))]_+}^{\text{Directed}}
\end{aligned} \tag{4.5}$$

In this demand function it can be seen that the high firm receives all directed consumers with a taste greater than a_A and undirected consumers from the low firm with a taste more than $a_A + \frac{s}{H - L}$ (if any exist). Note also that a_A is taken exogenously by the high firm knowing that consumers use their expectation of P_H (rather than the high firm's choice of P_H) to determine their search path. The high firm sells to all consumers that approach it with tastes between 1 and the maximum of a_H and a_{HL} .

The demand function for the low firm can be written as:

$$\begin{aligned}
Q_{\text{Low}}(P_L) = & \overbrace{\frac{\psi}{2} [\min(1, a_T(P_L)) - a_L(P_L)]_+}^{\text{Undirected - own}} + \overbrace{\frac{\psi}{2} \left[\min\left(a_A - \frac{s}{H - L}, a_T(P_L)\right) - \max(a_{HLM}, a_L(P_L)) \right]_+}^{\text{Undirected Runoff from the } H \text{ firm}} \\
& + \overbrace{(1 - \psi) [\min(a_A, a_T(P_L)) - a_L(P_L)]_+}^{\text{Directed}}
\end{aligned} \tag{4.6}$$

In this case the low firm receives all directed consumers with a taste less than a_A and undirected consumers from the high firm with tastes between a_H and a_{HLM} (if any exist). The low firm sells to all consumers that approach it with tastes between a_T and a_L .^{4.10}

At this point we recall the assumption that search costs are sufficiently small, such that the best alternative to buying for the marginal consumer at the high firm is to go to the low firm. Mathematically this translates to the requirement that search costs are sufficiently low that in every equilibrium we always have $a_H > a_{HL}$ which implies that we must have $s < L \left(\frac{P_H}{H} - \frac{P_L}{L} \right)$. We can prove that for a sufficiently low search cost, all equilibria will have the property that equilibrium prices satisfy $\frac{P_H}{H} > \frac{P_L}{L}$ and hence it is possible to find a positive search cost that satisfies this condition.

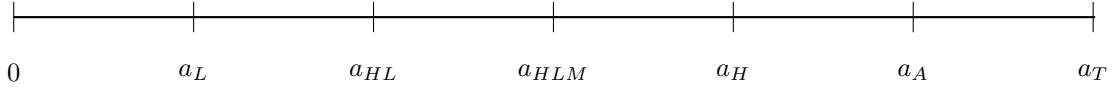
^{4.9}We use here and throughout the notation $[x]_+ = \max(0, x)$.

^{4.10}The fact that $H > L > 0$ ensures that tastes higher than a_T strictly prefer to leave for the high firm and tastes lower than a_L strictly prefer to leave the market and consumers in the interim prefer to buy.

Lemma 3. *For a sufficiently low search cost, there are no equilibria where $\frac{P_H}{H} \leq \frac{P_L}{L}$*

Proof. See appendix 4.A. □

In equilibrium we must have $P_H^E = P_H$ and $P_L^E = P_L$ and so mathematically we must have $a_T > a_A > a_H$ and $a_{HLM} > a_L$. As any equilibria will have the property $\frac{P_H}{H} > \frac{P_L}{L}$, we can additionally infer that $a_{HL} > a_L$, $a_T > a_L$ and $a_H > a_{HLM}$.^{4.11} Putting these together leaves the only remaining taste ordering of $0 < a_L < a_{HL} < a_{HLM} < a_H < a_A < a_T$.



At this point it can be noted that the marginal consumer at the high firm has a taste of a_H which is strictly less than the taste of the ex-ante indifferent consumer a_A . This has profound implications for the equilibrium as highlighted in the following proposition:

Proposition 1 (Unraveling of equilibrium without undirected consumers). *In the special case where there are no undirected consumers ($\psi \equiv 0$) there cannot exist equilibria where a positive measure of consumers approach both the high and low quality firms.*

Proof. A necessary condition for equilibrium in the absence of undirected consumers is that $a_H = a_A$. If we had $a_H > a_A$ then consumers in the interval $[a_A, a_H)$ will not buy at the high firm and would be better off going to the low firm ex-ante. If we had $a_H < a_A$ then the high firm sells to consumers in the interval $[a_A, 1]$ whilst setting a price to make a consumer a_H indifferent. If this firm increased its price to make a_A indifferent it could maintain its quantity at a higher price. □

One way to think about this result is as an unraveling mechanism. Consider if the firm received all consumers with tastes in the interval $[x, 1]$ and x is sufficiently high that the high firm wants to price to sell to all consumers with a taste greater than x .^{4.12} The firm should optimally price to make the consumer with taste x indifferent to buying and walking away to the low firm. This implies a price of $x(H - L) + P_L^E + s$ which leaves the consumer with a taste x as getting utility of $Lx - P_L^E - s$. This consumer would be strictly better off going to the low firm initially however as she would get an expected payoff of $Lx - P_L^E$. If this consumer (and others of similar taste) deviate to the low firm, then the high firm will be approached by consumers with tastes in the interval $[x', 1]$ where $x' > x$. It will again be optimal for the high firm to price high enough so that the consumer with taste x' would be better off ex-ante going to the low quality firm. This unraveling would continue until the high firm has no mass of consumers remaining.

This proposition does not hold when there are undirected consumers, however, as the high firm may set a price to make an undirected consumer with a taste lower than a_A indifferent. The effect

^{4.11}All of these inequalities come immediately from simple algebraic manipulation of the formulae in table 4.1.

^{4.12}In the complementary case when x is low there cannot be an equilibrium as some consumers would not buy from the high firm and would instead go to the low firm - thus these consumers would be better off going to the low firm ex-ante.

of $a_H > a_A$ still has a substantial impact on the resulting equilibrium as it implies that the optimal price for the high firm will be quite high. To see this informally, note that the first order condition of the general profit equation $\pi = PQ(P)$ imply that the optimal price satisfies $P = -\frac{Q(P)}{Q'(P)}$. When there are few undirected consumers then $Q'(P)$ is quite low which implies a high optimal price.

We will show this formally by first rewriting the demand function (4.5) to incorporate the taste ordering discussed following lemma 3 and noting that the marginal consumer will have a taste between 0 and a_A :

$$Q_{\text{High}}(P_H) = \underbrace{\frac{\psi}{2} [1 - a_H(P_H)]}_{\text{Undirected - own}} + \underbrace{\frac{\psi}{2} \left[1 - \left(a_A + \frac{s}{H-L} \right) \right]}_{\text{Undirected runoff from the } L \text{ firm}} + \underbrace{(1 - \psi) [1 - a_A]}_{\text{Directed}} \quad (4.7)$$

Taking first order conditions for $\pi_{\text{High}} = P_H Q_{\text{High}}(P_H)$ and rearranging yields:

$$P_H = \frac{H a_A \psi - 2H a_A + 2H - L a_A \psi + 2L a_A - 2L + P_L^E \psi}{2\psi} \quad (4.8)$$

Now looking at the low firm's demand function it is not possible to determine if the firm will lose undirected consumers to the high firm. That is it is unclear if $a_T < 1$ in equilibrium. In the succeeding analysis we will assume $a_T < 1$ and do the complementary case in appendix 4.C. First rewriting the demand function for the low firm (4.6):

$$Q_{\text{Low}}(P_L) = \underbrace{\frac{\psi}{2} [a_T(P_L) - a_L(P_L)]}_{\text{Undirected - own}} + \underbrace{\frac{\psi}{2} \left[a_A - \frac{s}{H-L} - a_{HLM} \right]}_{\text{Undirected Runoff from the } H \text{ firm}} + \underbrace{(1 - \psi) [a_A - a_L(P_L)]}_{\text{Directed}} \quad (4.9)$$

Taking first order conditions for $\pi_{\text{Low}} = P_L Q_{\text{Low}}(P_L)$ and rearranging yields:

$$P_L = \frac{H L a_A \psi - 2H L a_A + H L a_{HLM} \psi - L^2 a_A \psi + 2L^2 a_A - L^2 a_{HLM} \psi - L P_H^E \psi}{2H\psi - 4H - 4L\psi + 4L} \quad (4.10)$$

In equilibrium we will have $P_H^E = P_H$ and $P_L^E = P_L$. Substituting this, $a_{HLM} = \frac{P_L + s}{L}$ and $a_A = \frac{P_H - P_L}{H - L}$ into equations 4.8 and 4.10 and solving for equilibrium prices yields:

$$P_H = \frac{2(H-L)(4H-2L-H\psi+2L\psi-\psi s)}{8(H-L)+H\psi(2-\psi)+2L\psi(1+\psi)} \quad (4.11)$$

$$P_L = \frac{(H-L)(4L-\psi^2 s-2\psi s)}{8(H-L)+H\psi(2-\psi)+2L\psi(1+\psi)} \quad (4.12)$$

$$\pi_H = \frac{2\psi(H-L)(H\psi-4H-2L\psi+2L+\psi s)^2}{(8(H-L)+H\psi(2-\psi)+2L\psi(1+\psi))^2} \quad (4.13)$$

$$\pi_L = \frac{(H-L)(2H-H\psi+2L\psi-2L)(-4L+\psi^2 s+2\psi s)^2}{2L(8(H-L)+H\psi(2-\psi)+2L\psi(1+\psi))^2} \quad (4.14)$$

We can also write an expression for the ex-ante indifferent consumer and the marginal undirected consumer who leaves the low firm for the high:

$$a_A = \frac{8(H - L) + 2\psi(2L - H) + \psi^2 s}{8(H - L) + H\psi(2 - \psi) + 2L\psi(1 + \psi)} \quad (4.15)$$

$$a_T = \frac{8H^2 - 2H^2\psi + 6HL\psi - 16HL + 2H\psi^2 s - 2H\psi s - 8Hs - 4L^2\psi + 8L^2 - 3L\psi^2 s - 2L\psi s + 8Ls}{(H - L)[8(H - L) + H\psi(2 - \psi) + 2L\psi(1 + \psi)]} \quad (4.16)$$

At this point we can state this chapter's second proposition establishing equilibria for the game:^{4.13}

Proposition 2. *For any given ψ satisfying $a_T < 1$ (with a_T given by equation 4.16) there exists a PBE with firms pricing P_H , P_L according to equations 4.11 and 4.12 respectively and directed consumers with tastes $[0, a_A]$ approaching the low firm and consumers with taste $[a_A, 1]$ approaching the high firm with a_A according to equation 4.15. Firms have correct beliefs over taste distribution of consumers approaching them and consumers have correct beliefs over the quality of goods.*

Of the undirected consumers that initially approach the high firm, consumers with taste $[a_H, 1]$ will buy; consumers with taste $[a_{HLM}, a_H]$ will go the low firm and buy and consumers with taste $[0, a_{HLM}]$ will leave the market. Of the undirected consumers that initially approach the low firm, consumers with taste $[a_T, 1]$ will go to the high firm, consumers with taste $[a_L, a_T]$ will buy from the low firm and consumers with taste $[0, a_L]$ will leave the market.

There are a few interesting features of this equilibrium. First we will consider the special case where there are no directed consumers ($\psi = 1$). In this case we get the intuitive result that the high quality firm earns strictly more than the low firm. Dividing equation 4.13 by equation 4.14 shows that the high firm's profit is $\frac{4L(3H-s)^2}{H(4L-3s)^2}$ times higher than the profit of the low firm. For a small search cost (in the limit as $s \rightarrow 0$) this approaches $\frac{9H}{4L}$. This is a smaller ratio of high to low firm profits however than occurs in the competitive market setting where the high firm earns $\frac{4H}{L}$ times more than the low firm.^{4.14}

Firm profits change markedly however when there are directed consumers in the market. This is illustrated by figure 4.2 which shows the demand curves^{4.15} faced by the high and low quality firms under two sets of parameters with their optimal prices, quantities and profits being indicated by the shaded rectangles. In both cases there is a search cost of $s = 0.001$ and product qualities of $L = 1$ and $H = 1.5$ for the low and high firms respectively. In the left hand panel^{4.16} 25% of consumers are undirected and so $\psi = 0.25$ while on the right hand panel^{4.17} there are 10% undirected consumers and so $\psi = 0.10$. Considering first the left hand panel it can be seen that both demand curves have a flatter segment at high prices where firms sell to their directed consumers and undirected

^{4.13}For the equilibrium values in the alternative case where $a_T > 1$ see appendix 4.C.

^{4.14}See appendix 4.B for analysis of the competitive market and comparison with search market profits.

^{4.15}Each demand curve is drawn for the equilibrium case where the competing firms set their equilibrium price and consumer price beliefs are the prices in the equations 4.11 and 4.12.

^{4.16}The resultant equilibrium quantities are $P_L = 0.379$, $P_H = 0.781$, $\pi_L = 0.161$, $\pi_H = 0.152$, $a_A = 0.805$ and $a_T = 0.806$.

^{4.17}The resultant equilibrium quantities are $P_L = 0.468$, $P_H = 0.922$, $\pi_L = 0.208$, $\pi_H = 0.085$, $a_A = 0.908$ and $a_T = 0.909$.

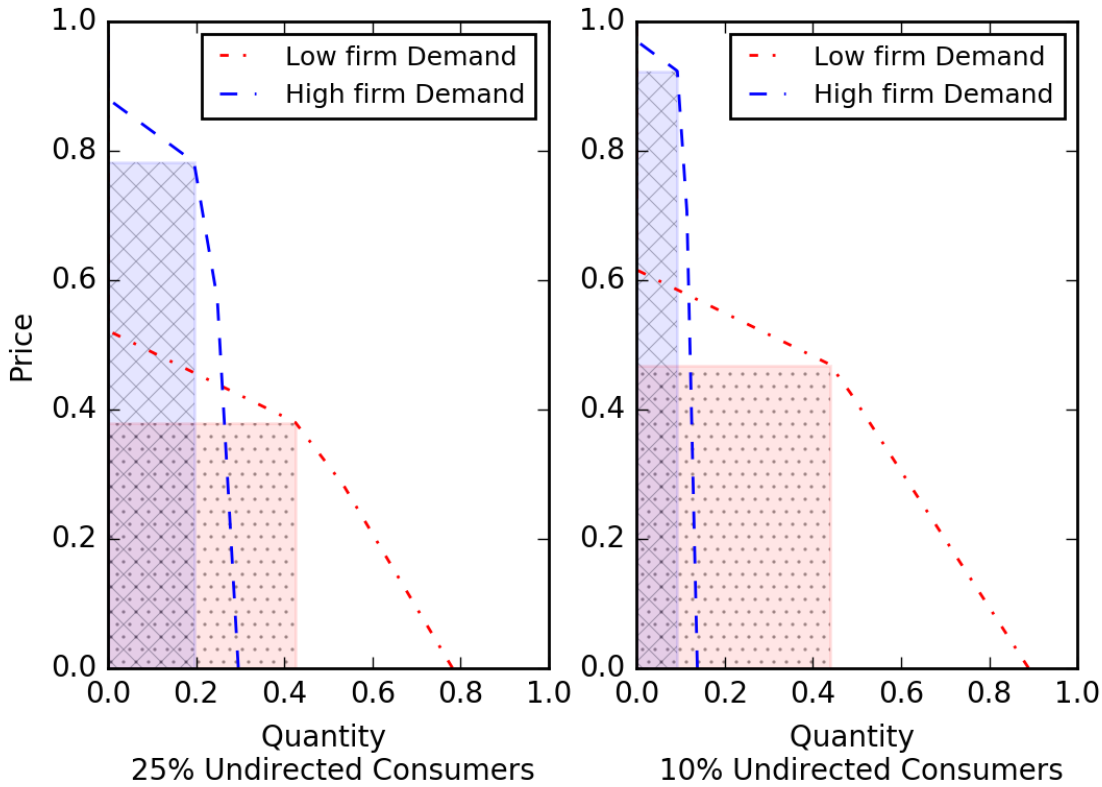


Figure 4.2: Equilibrium demand curves

consumers with the same taste as their directed consumers. In these flatter segments the high firm sells to consumers with tastes in their interval $[a_A, 1]$ while the low quality firm sells to consumers with tastes in the interval $[a_L, a_A]$. As price is lowered however the firms have eventually sold to all consumers in these intervals and start selling to undirected consumers with tastes outside these intervals. The slope of each demand curve becomes steeper reflecting the fact that there are fewer undirected consumers approaching them.

Looking now at the right panel, the only change to the parameters is that the population of undirected consumers has been reduced. In accordance with equation 4.15, a_A shifts upwards which results in the high firm receiving fewer directed consumers and the flat segment of the demand curve is narrower as a result. As the low firm receives more high taste consumers it raises its price which deteriorates the outside option for directed consumers at the high firm. As a result the high firm can sell to their directed consumers at a higher price. Overall however their profit has deteriorated relative to the case where more consumers were undirected.

The key takeaway from this figure is that even in search markets where quality is known to consumers and where the fraction of undirected consumers is considerably above zero, the low firm can earn greater profits than the high firm.^{4.18} The reduction in the number of undirected consumers allows the low firm to capture market share from the high quality firm. This observation leads to the following proposition for the refined equilibrium as the proportion of undirected consumers approaches zero:

^{4.18}In the left panel the low firm earns profits that are around 6% higher than the high firm whilst in the right panel the low firm earns 142% more.

Proposition 3. *The sole refined equilibrium is one where no consumers approach the high firm who makes no profit. The low firm sells a quantity of $\frac{1}{2}$ at a price of $\frac{L}{2}$ for a profit of $\frac{L}{4}$.*

Proof. Equation 4.15 describing the ex-ante indifferent consumer taste (a_A) is continuous in ψ and is 1 when $\psi = 0$. This indicates that as $\psi \rightarrow 0$ we will have $a_T = a_A + \frac{s}{H-L}$ exceeding 1. Once ψ is sufficiently high that $a_T > 1$ the relevant equation describing a_A is as given in equation 4.C.6 which also exhibits $a_A \rightarrow 1$ as $\psi \rightarrow 0$.

As in the limit no directed consumers approach the high firm and no undirected consumers exist the high firm will make no profit. The low firm's price, quantity and profit can be found by taking the limit as $\psi \rightarrow 0$ for equations 4.C.3 and 4.C.5. $\square$

As a final point before the model is extended in the next section note that in the special case when $\psi \equiv 0$ (as opposed to the refined equilibrium which is a limit as $\psi \rightarrow 0$) it is also possible to establish all consumers visiting the low quality firm as an equilibrium.^{4.19} In this case however it would be necessary to state beliefs of the high firm over the tastes of consumers who deviate to visit it out of equilibrium. The assumption that the high firm could observe the taste of a deviating consumer before pricing (and assuming a finite amount of consumers so each is of positive mass) or that the high firm believes that deviating consumers are of taste 1 would be sufficient to sustain this equilibrium.

4.3 Extending the model with disclosure

Now we extend the model presented in section 4.2 to allow for disclosure. We assume that either firm can choose to disclose the qualities of both firms to the market.^{4.20} If neither firm chooses to disclose then both goods appear identical to consumers and the "asymmetric quality information" subgame results. In the event that one of the two firms discloses quality to the market the "full quality information" subgame results. The refined equilibrium concept introduced in definition 1 is used in this extended game.^{4.21}

We note that the equilibrium of the full quality information subgame is exactly what was discussed in section 4.2. The remaining tasks are to find the equilibrium in the asymmetric quality information subgame and then determine the optimal disclosure decisions for each firm.

^{4.19}For appropriate low firm beliefs on deviating consumers it is also possible to establish an equilibrium of the subgame (with $\psi \equiv 0$) where all consumers approach the high quality firm. As can be seen in the preceding analysis however this alternate equilibrium would not survive trembling hand refinement through trembling the initial market entry strategy of consumers choosing to approach the low or high firm.

^{4.20}Alternatively this can be thought of as one firm disclosing the relative qualities of its good in comparison to the other.

^{4.21}We could also consider the nonrefined equilibrium when ψ is not close to zero. In this case it is possible that high firms would like to disclose and low firms would not. As this unremarkable result is not the focus of this chapter the equilibrium is not explored here but can easily be derived by comparing 4.13 and 4.14 with equation 4.19.

4.3.1 The asymmetric quality information subgame

In the asymmetric quality information subgame both firms appear identical so both directed and undirected consumers approach firms at random, each of which has an expected quality of $\frac{H+L}{2}$. In equilibrium each firm will be approached by a mass of $\frac{1}{2}$ with tastes uniformly distributed on the unit interval. The condition for a consumer to buy is:

$$a\frac{H+L}{2} - P \geq \max(0, a\frac{H+L}{2} - P^E - s) \quad (4.17)$$

Where P^E is the consumer's expected price from the other firm. From the Diamond (1971) paradox result the right hand side of this expression will equal 0 for the consumer made (ex post) indifferent in equilibrium. Hence profit for an individual firm can be written as:

$$\pi(P) = \frac{1}{2}P \left[1 - \frac{P}{\frac{H+L}{2}} \right] \quad (4.18)$$

From the first order conditions the optimal price and profit for each firm is:

$$P = \frac{\frac{H+L}{2}}{2} \quad \pi = \frac{\frac{H+L}{2}}{8} \quad (4.19)$$

Which implies that both firms sell only to consumers with a taste greater than $\frac{1}{2}$.

4.3.2 The disclosure decision

In order to ascertain whether either firm will choose to disclose quality to the market it is necessary to compare each firm's profit in the full quality information subgame and in the asymmetric quality information subgame. Considering the refined full information equilibrium where all consumers visit the low firm and the high firm makes zero profits it is clear that the high firm will not choose to disclose. Whilst this firm can make $\frac{H+L}{16}$ in the asymmetric quality information market its profit tends to zero in the full quality information case as $\psi \rightarrow 0$. The condition for the low firm to prefer to disclose is found by comparing its profit in the full quality information case which tends to $\frac{L}{4}$ as $\psi \rightarrow 0$ to its profits in the asymmetric quality information case $\frac{H+L}{16}$. This shows that the low firm will strictly prefer to disclose if $H < 3L$.

Proposition 4. *If $H > 3L$ then the sole refined equilibrium is one where no firm discloses and the asymmetric quality information equilibrium described in section 4.3.1 results. If $H < 3L$ then the sole refined equilibrium is one where the low quality firm discloses and the full quality information refined equilibrium described by proposition 2 results. If $H = 3L$ then the two aforementioned equilibria are possible.*

Proof. See the paragraph preceding this proposition. □

4.3.3 Welfare

The profits and surpluses corresponding to the refined PBEs from proposition 4 can be seen in table 4.2 along with the profits and surpluses that would result from the asymmetric quality information subgame. It can be seen that the full quality information refined equilibrium delivers lower surplus than occurs under asymmetric quality information. In the full information equilibrium the unravelling mechanism causes only the low quality firm to be visited. In this limiting case the high firm prices at a high level which deters consumers from visiting it and the low quality firm acts as a monopolist. Indeed the full quality information refined equilibrium delivers the same surplus as would occur in a monopolistic market containing only the low quality firm.

In the asymmetric quality information case both firms appear identical to consumers and this market behaves like a traditional search market. Each firm will earn equal profits and attract equal market share. With the logic of the Diamond (1971) result each will price at their monopoly level and the market will generate the same surplus as a monopolist firm with a quality of $\frac{H+L}{2}$. Thus while the Diamond result shows that a search market will generate less surplus than a competitive market due to the monopoly pricing of firms, this chapter shows an additional effect on welfare with all sales being made by the lower quality firm.

	Full Quality Information Refined Equilibrium	Asymmetric Quality Information Refined Equilibrium
Average Purchased Quality	L	$\frac{L+H}{2}$
Low firm Profit	$\frac{L}{4}$	$\frac{L+H}{16}$
High firm Profit	0	$\frac{L+H}{16}$
Sale Quantity	$\frac{1}{2}$	$\frac{1}{2}$
Producer Surplus	$\frac{L}{4}$	$\frac{L+H}{8}$
Consumer Surplus	$\frac{L}{8}$	$\frac{L+H}{8}$
Total Surplus	$\frac{3L}{8}$	$\frac{L+H}{4}$

Table 4.2: Profits and surpluses in each equilibria

4.4 Other extensions

4.4.1 Multi-product firms

The endogenous entry of consumers to the market has interesting implications in a setting of multi-product firms. Multi-product firms may also be thought to arise from high qualities seeking to thwart the unraveling mechanism of this chapter by encouraging low taste consumers to approach them. In this extension we consider that there are two firms: one that sells both the high and low quality good (the “*both*” firm) and the other that sells only the low quality good (the “*low*” firm).^{4.22} We will consider only the benchmark full quality information model presented in section 4.2.

^{4.22}We do not explicitly consider the possible case of a high and a both firm and the other possible case of two both firms. In the former case the both firm will dominate the market both from the unravelling mechanism as well as monopoly screening considerations encouraging the firm to offer the high good at a lower price than the firm selling only the high good. The case with two both firms is likely to result in an equilibrium with each firm evenly splitting the market and selling high goods to high taste consumers and low goods to lower taste consumers.

This is an interesting extension because a monopolistic screening problem appears for the both firm. The lower is the price they set for the low quality good, the more high taste consumers will opt for it over the higher margin high quality good. In the case of endogenous market entry, the firm selling both goods will encounter fewer low taste consumers than the low quality firm that specialises in only selling this good. This ratio of high taste to low taste consumers amplifies the monopoly screening effect. The firm selling both goods will not want to price lower than the low firm for fear of high taste consumers opting for it over the high quality good. The implication is that a firm with high quality goods trying to avert the unraveling result by also selling low quality goods will not be successful in this endeavour. Indeed in the full quality information subgame as $\psi \rightarrow 0$, the low firm still takes over the market:

Proposition 5. *In the unique, refined equilibrium of the full quality information subgame, the both firm will price the low good at $P_L + s$ where P_L is the low firm's price for this good. This means the both firm sells to all undirected consumers that visit it but low taste directed consumers still prefer to approach the low firm. As is the case in proposition 3 as $\psi \rightarrow 0$ the ex ante indifferent consumer taste will approach 1, $a_A \rightarrow 1$. The both firm's profit will tend to zero and the low firm's profit to $\frac{L}{4}$ in this refined equilibrium.*

Proof. The proof is included in appendix 4.D □

4.4.2 Endogenous quality

In the benchmark model quality is exogenous. In this extension, we consider the case where quality is endogenous, and firms are able to choose their quality level. We assume that firms can costlessly choose any quality level $Q \in [\underline{Q}, \bar{Q}]$ where $\underline{Q} \geq 0$ is a minimum quality standard imposed by legislation/regulation and $\bar{Q}$ is some upper limit set by technology. We consider only the full quality information case where firms choose their quality level concurrently with their pricing decision. Otherwise, the game proceeds as per the model of section 4.2 and we will consider only refined equilibria.

At this point we can state a proposition describing the quality choices in this setting:

Proposition 6. *In all possible refined equilibria, both firms will choose the minimum quality level $\underline{Q}$.*

Proof. Denoting the first and second firm's qualities by Q_1, Q_2 , no equilibrium can exist with $Q_1 > Q_2 \geq \underline{Q}$. In this setting, the second firm could increase their profits by increasing their quality closer to Q_1 . By symmetry no equilibrium can exist with $Q_2 > Q_1 \geq \underline{Q}$.

In any putative equilibrium with $Q_1 = Q_2 > \underline{Q}$, one firm can earn a discontinuous increase in profits by reducing their quality by an epsilon and disclosing qualities to the market. This possibility exists until one of the firms offers a quality of zero.

Considering the putative equilibrium where $Q_1 = Q_2 = \underline{Q}$. Neither firm can increase their profits given the strategy of the opposing firm, and this is an equilibrium. $\square$

The intuition here is that in a mechanism similar to the Bertrand (1883) argument, firms can capture the whole market if they undercut the other firm on *quality*. This potential to earn a discontinuous increase in profits through undercutting will persist until one firm has a quality of zero and no further undercutting is possible.

4.4.3 Many firms

The full quality information equilibrium result where $a_A \rightarrow 1$ as $\psi \rightarrow 0$ extends to the setting of many firms.^{4.23} It also appears likely that this result would also extend to the model of section 4.3 depending on how disclosure was modelled in a multifirm setting. This chapter has so far modelled disclosure as one firm revealing both qualities. Whilst this is credible in the duopolistic setting as a firm can disclose the relative differences in the two goods, it does not extend easily to the multifirm setting.

A natural way in which disclosure could be added to the model would be to allow firms to choose to disclose their quality or to pool by choosing to stay silent. Depending on what disclosures occur, there could be no disclosures with the asymmetric quality information subgame occurring, there could be all high quality or all low quality firms disclosing which would result in the full quality information subgame occurring, there could be some (but not all) of one group of firms disclosing resulting in a pooled quality level and a set of firms of known quality and finally there could be an information setting where three quality levels exist for low firms, high firms and an intermediate group of pooled firms.

With a sufficiently small search cost, the likely equilibrium would exhibit the low taste marginal consumer at a low quality firm indifferent to buying and leaving the market, while the low taste marginal consumer at a pooled firm is indifferent to buying and going to a low quality firm and the marginal consumer at the high quality firm is indifferent to buying and going to a pooled firm. In this setting, the same unraveling result will occur as described in proposition 1. Consider a split with consumers of taste $[0, x)$ going to the low firms, consumers of taste $[x, x')$ with $x' > x$ going to the pooled firms and consumers of taste $[x', 1]$ going to the disclosing high firms. In the absence of undirected consumers, the high firm will want to price to make the consumer with taste x' indifferent between buying and leaving. This will lead to consumers of taste x' being better off going to a pooled firm ex ante which results in the same unraveling as discussed before. The same unraveling would also occur at the margin of the low firms and the pooled firms.^{4.24} This will lead to low firms disclosing as pooled and high quality firms make no profits in the refined equilibria.

^{4.23}This can be seen in appendix 4.E.

^{4.24}The calculations for the case of unraveling with three levels of quality and many firms are shown in appendix 4.F.

4.5 Conclusion

This chapter has presented a consumer search model with two key features: consumers have heterogeneous marginal utility from quality and enter the market endogenously. It is shown that when consumers have full information regarding quality the only equilibrium that survives refinement is one where only the low quality firms sell goods. This result comes about because the effect of quality on pricing decisions can be anticipated by consumers. The high firm will price to make one of the consumers approaching it indifferent between buying and searching further after this consumer has arrived at the firm. Anticipating this the consumer would be better off going a low quality firm *ex ante*. Having lost such consumers the high quality firm will want to raise its price to make a higher taste consumer indifferent. And thus there is an unraveling result where all consumers end up shopping at the low quality firm.^{4.25}

When we extend the model to consider the possibility of firm's voluntarily disclosing their low quality we find that it can be rational for low quality firms to disclose their low quality. A pooling equilibrium may be sustainable however if the quality of the high firm's goods are sufficiently higher than the quality of the low firm's goods. In such cases the low firm will prefer to pool as this results in a higher perceived value of their good. The analysis indicates that information provision is not necessarily harmful to a low quality firm in markets exhibiting search frictions. It may indeed be in the best interests of a low quality firm to disclose its low quality. Similarly it may not be in the interests of a high quality firm to disclose its high quality as that may deter consumers from approaching the firm for fear of high prices.

We also examine competition between a firm selling only low quality goods and a firm offering both high and low quality goods. Here we find the surprising conclusion that the firm selling only the low quality good can take over the market as a monopolistic screening issue faced by the firm selling both goods will lead it to offer a higher price for the low quality good. Finally we consider the effect of firms endogenously choosing their quality level. In this case we find that the unraveling effect can lead firms to try to undercut their rival firms on quality. As consumers believe a lower quality good to be lower price, a firm will attempt to ensure they are positioned as the lower quality firm in the market.

Whilst full information in this chapter's model can boost a low firm's profits it is generally bad for welfare. Both consumer surplus and producer surplus are decreased by consumers being aware of each firm's quality levels. This implies that it may be welfare improving for regulators to impose minimal quality standards in the market. This chapter also provides an argument in support of restrictions on the advertising of low quality products such as the restrictions the American Bar Association applied on lawyer advertising prior to 1977.

^{4.25}At a methodological level, consumer search models often have equilibria where no consumer searches beyond their initial firm. A further contribution of this chapter is that it highlights that in such a market with heterogeneity, the assignment of consumers to their initial firm is important. In this chapter's model the equilibrium induced by endogenous market entry differs markedly from the equilibrium induced by random assignment of consumers to firms (which can be seen by considering equations 4.11 to 4.16 when $\psi = 1$).

Appendices

4.A Proof of lemma 3

To prove lemma 3 we will show first that given sufficiently small search costs, no equilibrium can satisfy $\frac{P_H}{H} = \frac{P_L}{L}$ before showing that given small search costs no equilibrium can exhibit $\frac{P_H}{H} < \frac{P_L}{L}$.

Lemma 4. *For a sufficiently low search cost, there are no equilibriums where $\frac{P_H}{H} = \frac{P_L}{L}$:*

Proof. In the first case note that in an equilibrium with $\frac{P_H}{H} = \frac{P_L}{L} = 0$ then neither firm is making any profits. The high firm could earn positive profits by setting a small price and selling to high taste consumers.

In the second case we consider a putative equilibria where $\frac{P_H}{H} = \frac{P_L}{L} > 0$. We will use the notation $x = \frac{P_H}{H} = \frac{P_L}{L}$ and note that $a_A = x$ and the low firm gets all consumers with a lower taste and the high firm gets all consumers with a higher taste. At first we will assume $a_T \leq 1$. Using the demand function (4.6) we can write the profit for the low firm pricing at xL :

$$\begin{aligned}\pi_{\text{Low}}(xL) &= xL \frac{\psi}{2} \left[x + \frac{s}{H-L} - x \right] \\ &= \frac{s x L \psi}{2(H-L)}\end{aligned}\tag{4.A.1}$$

where all sales are to undirected consumers that visit the low firm initially. Note that sales are entirely dependent on the extent of the search cost s . Now if the low firm instead reduced their price to $xL - \epsilon$ where $xL > \epsilon > 0$ then their profit would be:

$$\begin{aligned}\pi_{\text{Low}}(xL - \epsilon) &= [xL - \epsilon] \left[\frac{\psi}{2} \left[x + \frac{\epsilon + s}{H-L} - (x - \frac{\epsilon}{L}) \right] + (1 - \psi) \left[x - (x - \frac{\epsilon}{L}) \right] \right] \\ &= xL \left[\frac{\psi(\epsilon + s)}{2(H-L)} + \frac{\epsilon}{L} (1 - \frac{\psi}{2}) \right] - \epsilon \left[\frac{\psi(\epsilon + s)}{2(H-L)} + \frac{\epsilon}{L} (1 - \frac{\psi}{2}) \right] \\ &= \pi_{\text{Low}}(xL) + xL \left[\frac{\psi(\epsilon)}{2(H-L)} + \frac{\epsilon}{L} (1 - \frac{\psi}{2}) \right] - \epsilon \left[\frac{\psi(\epsilon + s)}{2(H-L)} + \frac{\epsilon}{L} (1 - \frac{\psi}{2}) \right]\end{aligned}$$

Where sales are to undirected consumers who visit the firm initially as well as directed consumers with a taste less than a_A . As $xL > \epsilon$ we will have $xL \left[\frac{\psi(\epsilon)}{2(H-L)} + \frac{\epsilon}{L} (1 - \frac{\psi}{2}) \right] - \epsilon \left[\frac{\psi(\epsilon + s)}{2(H-L)} + \frac{\epsilon}{L} (1 - \frac{\psi}{2}) \right]$ positive for a sufficiently small s .

Now considering the case where $a_T > 1$. Using the demand function (4.6) we can write the profit for the low firm pricing at xL :

$$\begin{aligned}\pi_{\text{Low}}(xL) &= xL \frac{\psi}{2} [1 - x] \\ &= \frac{xL\psi}{2} (1 - x)\end{aligned}$$

where all sales are to undirected consumers that visit the low firm initially. Note that as $a_T > 1$ then $(1 - x) < \frac{s}{H-L}$. Now if the low firm instead reduced their price to $xL - \epsilon$ where $xL > \epsilon > 0$ and ϵ is sufficiently small that a_T is still greater than one then their profit would be:

$$\begin{aligned}\pi_{\text{Low}}(xL - \epsilon) &= [xL - \epsilon] \left[\frac{\psi}{2} \left[1 - \left(x - \frac{\epsilon}{L}\right) \right] + (1 - \psi) \left[x - \left(x - \frac{\epsilon}{L}\right) \right] \right] \\ &= [xL - \epsilon] \left[\frac{\psi}{2} (1 - x) + \left(1 - \frac{\psi}{2}\right) \frac{\epsilon}{L} \right] \\ &= \pi_{\text{Low}}(xL) + xL \left[\left(1 - \frac{\psi}{2}\right) \frac{\epsilon}{L} \right] - \epsilon \left[\frac{\psi}{2} (1 - x) + \left(1 - \frac{\psi}{2}\right) \frac{\epsilon}{L} \right]\end{aligned}$$

Where sales are to undirected consumers who visit the firm initially as well as directed consumers with a taste less than a_A . As $(1 - x)$ is small for a sufficiently small s and $xL > \epsilon$ we will get $xL \left[\left(1 - \frac{\psi}{2}\right) \frac{\epsilon}{L} \right] - \epsilon \left[\frac{\psi}{2} (1 - x) + \left(1 - \frac{\psi}{2}\right) \frac{\epsilon}{L} \right]$ as positive and this is a profitable deviation. $\square$

Lemma 5. *For a sufficiently low search cost, there are no equilibria where $\frac{P_H}{H} < \frac{P_L}{L}$:*

Proof. Suppose that $\frac{P_H}{H} < \frac{P_L}{L}$. We will denote $x_L = \frac{P_L}{L}$ and $x_H = \frac{P_H}{H}$. In this case $a_A = \frac{Hx_H - Lx_L}{H-L}$.

We can note this implies we must have $a_T < 1$ if the search cost is small. This is because $a_T > 1$ would imply:

$$\begin{aligned}\frac{Hx_H - Lx_L + s}{H - L} &> 1 \\ L(1 - x_L) + s &> H(1 - x_H)\end{aligned}$$

Now as $H > L$ and $(1 - x_H) > (1 - x_L)$, it is not possible for this to hold if the search cost is sufficiently small.

Now examining the case where $a_T \leq 1$, the case profit for the low firm is:

$$\begin{aligned}\pi_{\text{Low}}(x_L L) &= x_L L \left[\frac{\psi}{2} \left[\frac{Hx_H - Lx_L + s}{H - L} - x_L \right]_+ \right] \\ \pi_{\text{Low}}(x_L L) &= \frac{\psi x_L L}{2} \left[\frac{H(x_H - x_L) + s}{H - L} \right]_+\end{aligned}$$

Where the firm only sells to undirected consumers that approach it initially if the search cost is sufficiently high (as $x_H < x_L$). Note for a sufficiently small s this profit is zero. Now if the low

firm lowers its price to $x_L L - L\epsilon$,^{4.26} it gets a profit of:

$$\begin{aligned}\pi_{\text{Low}}(x_L L - L\epsilon) &= (x_H L - \epsilon L) \frac{\psi}{2} \left[\frac{x_H(H-L) + \epsilon L + s}{H-L} - (x_H - \epsilon L) \right] \\ \pi_{\text{Low}}(x_L L - L\epsilon) &= \frac{\psi(x_H L - \epsilon L)}{2} \left[\frac{\epsilon L + s}{H-L} \right]\end{aligned}$$

Which is greater than $\pi_{\text{Low}}(x_L L)$ for a sufficiently small value of s . $\square$

4.B Equilibrium in a competitive market

In this appendix the benchmark model is analysed in the absence of search frictions resulting in an equilibrium similar to that of Shaked and Sutton (1982). All consumers buy one good knowing the two prices. There is no search cost and as a result the concept of directed/undirected consumers is not used here.

With similar logic as earlier in this chapter it can be noted that the set of consumers who will buy from a given firm will be a convex set. It can also be noted that the high firm will not sell to all consumers as this would require a price of 0 which would result in no profits.

We will use the notation of $[0, a_L]$ to describe the consumers who will not buy but will take the outside option; $[a_L, a_A]$ is the set of consumers who will buy from the low firm and $[a_A, 1]$ is the set of consumers who will buy from the high firm. Considering the condition for a consumer to be indifferent between the high and low firm's offering we get $a_A = \frac{P_H - P_L}{H-L}$. Considering a consumer indifferent between buying at the low firm and the outside option yields $a_L = \frac{P_L}{L}$. These can be used to write the firm profit functions:

$$\pi_H(P_L) = \max_{P_H} P_H \left[1 - \left[\frac{P_H - P_L}{H-L} \right]_+ \right]_+ \quad (4.B.1)$$

$$\pi_L(P_L) = \max_{P_L} P_L \left[\left[\frac{P_H - P_L}{H-L} \right]_+ - \left[\frac{P_L}{L} \right]_+ \right]_+ \quad (4.B.2)$$

Taking first order conditions of equations 4.B.1 and 4.B.2 yields the reaction functions $P_H(P_L) = \frac{H-L+P_L}{2}$ and $P_L(P_H) = \frac{LP_H}{2}$ which can be used to find the equilibrium price and profits:

$$P_L = \frac{L(H-L)}{4H-L} \quad P_H = \frac{2H(H-L)}{4H-L} \quad (4.B.3)$$

$$\pi_{L, \text{Comp}} = \frac{HL(H-L)}{(4H-L)^2} \quad \pi_{H, \text{Comp}} = \frac{4H^2(H-L)}{(4H-L)^2} \quad (4.B.4)$$

Examining the profit expressions (4.B.4), we can note in this setting the high firm's profit is always strictly higher than low firm's profit by a factor of $\frac{4H}{L}$.

Comparing the high firms profit in the search model (4.13) with no directed consumers ($\psi = 1$) to the high firm profit in the competitive model (4.B.1) we find that in the search case profits are $\frac{(3H-s)^2(4H-L)^2}{2H^2(9H-4L)^2}$ times higher. Taking the limit as $s \rightarrow 0$ this ratio translates to $\frac{9(4H-L)^2}{2(9H-4L)^2} = \left[\frac{3(4H-L)}{\sqrt{2}(9H-4L)} \right]^2$, If $\frac{H}{L} \leq \frac{4\sqrt{2}-3}{9\sqrt{2}-12} \approx 3.65$ then this profit ratio is greater than one. Now examining the

^{4.26}Note that this is always possible unless $x_H = 0$ which is not possible from lemma 4.

ratio of low firm profits it can be calculated that the low firms profits are $\frac{(4L-3s)^2(4H-L)^2}{2L^2(9H-4L)^2}$. In the limit as $s \rightarrow 0$ this ratio approaches $\left[\frac{8\sqrt{2}H-2\sqrt{2}L}{9H-4L}\right]^2$. This is more than one if $\frac{H}{L} > \frac{2\sqrt{2}-4}{8\sqrt{2}-9} \approx -0.5$ which is satisfied.

4.C Derivation of equilibrium when $a_T > 1$

We derive the equilibrium in the case when $a_T > 1$ which is likely when ψ is low and a_A is close to 1. First rewriting $Q_{\text{Low}}(P_L)$ (equation 4.9):

$$Q_{\text{Low}}(P_L) = \underbrace{\frac{\psi}{2} [1 - a_L(P_L)]}_{\text{Undirected - own}} + \underbrace{\frac{\psi}{2} \left[a_A - \frac{s}{H-L} - a_{HLM} \right]}_{\text{Undirected Runoff from the } H \text{ firm}} + \underbrace{(1-\psi) [a_A - a_L(P_L)]}_{\text{Directed}} \quad (4.C.1)$$

With the same solution steps as in section 4.2.1 we can derive the following expressions:

$$P_H = \frac{2H^2\psi - 8H^2 - 4HL\psi + 12HL + 2H\psi s + 2L^2\psi - 4L^2}{H\psi^2 - 2H\psi - 8H + 8L} \quad (4.C.2)$$

$$P_L = \frac{-HL\psi^2 - 4HL + H\psi^2 s + 2H\psi s + L^2\psi^2 + 4L^2}{H\psi^2 - 2H\psi - 8H + 8L} \quad (4.C.3)$$

$$\pi_H = \frac{2\psi (H^2\psi - 4H^2 - 2HL\psi + 6HL + H\psi s + L^2\psi - 2L^2)^2}{(H-L) (H\psi^2 - 2H\psi - 8H + 8L)^2} \quad (4.C.4)$$

$$\pi_L = \frac{(2-\psi) (-HL\psi^2 - 4HL + H\psi^2 s + 2H\psi s + L^2\psi^2 + 4L^2)^2}{2L (H\psi^2 - 2H\psi - 8H + 8L)^2} \quad (4.C.5)$$

$$a_A = \frac{8H^2 - 2H^2\psi - HL\psi^2 + 4HL\psi - 16HL + 2H\psi^2 s - 2H\psi s - 8Hs + L^2\psi^2 - 2L^2\psi + 8L^2 + 8Ls}{(H-L) (8(H-L) + 2H\psi - H\psi^2)} \quad (4.C.6)$$

$$a_T = \frac{8H^2 - 2H^2\psi - HL\psi^2 + 4HL\psi - 16HL + 2H\psi^2 s - 2H\psi s - 8Hs + L^2\psi^2 - 2L^2\psi + 8L^2 + 8Ls}{(H-L) (8(H-L) + 2H\psi - H\psi^2)} \quad (4.C.7)$$

4.D Multi-product firms

Now consider that there is one firm that sells both high and low quality goods (the “both” firm) and one that only sells the low quality firm (the “low” firm). P_H is the price of the high good (sold by the both firm), P_B is the price of the low good from the both firm and P_L is the price of the low good from the low firm. The profits of the low and both firm are given by π_L and π_B respectively. We will consider only the full information subgame. We will redefine the ex ante indifferent consumer's taste of a_A to be:

$$a_A = \frac{P_H - \min(P_L, P_B)}{H-L} \quad (4.D.1)$$

We will use λ to denote the fraction of directed consumers with tastes lower than a_A that go to the low firm upon entering the market. Clearly $\lambda = 1$ if in an equilibrium $P_L < P_B$ and $\lambda = 0$

if $P_L > P_B$. A consumer indifferent between buying and leaving a firm will choose to buy at the current firm.

We can note that no equilibrium can take place where $P_B > P_L + s$. In this case the both firm could reduce their price to $P_L + s$ and sell to low taste undirected consumers at the both firm while the outside option for these consumers (of buying the low good at total cost $P_L + s$) would stay the same. There can also be no equilibrium where $P_L > P_B + s$. In this case the low firm would sell no quantity and make no profit. They could make strictly positive profits by pricing at another level (for instance this firm can guarantee a positive profit by selling to undirected consumers at a price of $\frac{s}{2}$).

Now writing the firm profit functions for a putative equilibrium where $|P_B - P_L| \leq s$. In this case a consumer will never leave one firm to buy the low quality good from the other. The profit functions for each firm can be written as:

$$\pi_L = \max_{P_L} \overbrace{\frac{\psi}{2} P_L \left[\min(1, \frac{P_H^E - P_L + s}{H - L}) - \frac{P_L}{L} \right]}^{\text{Undirected}} + \overbrace{(1 - \psi) \lambda P_L \left[a_A - \frac{P_L}{L} \right]}^{\text{Directed}} \quad (4.D.2)$$

$$\begin{aligned} \pi_B = \max_{P_B, P_H} & \overbrace{\frac{\psi}{2} \left[P_B \left(\frac{P_H - P_B}{H - L} - \frac{P_B}{L} \right) + P_H \left(1 - \frac{P_H - P_B}{H - L} \right) \right]}^{\text{Undirected}} \\ & + \overbrace{(1 - \psi) \left[(1 - \lambda) P_B \left(a_A - \frac{P_B}{L} \right) + P_H (1 - a_A) \right]}^{\text{Directed}} + \overbrace{\frac{\psi}{2} P_H \left[1 - \left(a_A + \frac{s}{H - L} \right) \right]}^{\text{High taste runoff from low firm}} \end{aligned} \quad (4.D.3)$$

At this point it can be seen that intuitively as the both firm lowers the price of the low quality good (within $P - s \leq P_B \leq P_L + s$) it reduces the amount of the high quality good it can sell. The low firm faces no such problem. This leads to the following lemma:

Lemma 6. *For a small search cost and a nonzero fraction of undirected consumers, no equilibrium exists where $P_B \leq P_L$.*

Proof. We will show this by supposing the contrary such that $P_B \leq P_L$ and hence $a_A = \frac{P_H - P_B}{H - L}$. We will first guess that in equilibrium $\frac{P_H - P_L + s}{H - L} < 1$ Taking first order conditions of equations 4.D.2, 4.D.3 and rearranging

$$P_L = \frac{L(-2Ha_A\lambda\psi + 2Ha_A\lambda + 2La_A\lambda\psi - 2La_A\lambda + P_H^E\psi + \psi s)}{4H\lambda - 4H\lambda\psi + 2H\psi + 4L\lambda\psi - 4L\lambda} \quad (4.D.4)$$

$$P_H = \frac{H}{2} - \frac{L}{2} + p_B - \frac{1}{2\psi} (\psi(-H + L + a_A(H - L) + s) - 2(H - L)(a_A - 1)(\psi - 1)) \quad (4.D.5)$$

$$P_B = \frac{L(Ha_A\lambda\psi - Ha_A\lambda - Ha_A\psi + Ha_A - La_A\lambda\psi + La_A\lambda + La_A\psi - La_A + P_H^E\psi)}{2H\lambda\psi - 2H\lambda - H\psi + 2H - 2L\lambda\psi + 2L\lambda + 2L\psi - 2L} \quad (4.D.6)$$

Substituting in that in equilibrium $P_H^E = P_H$ and a_A must satisfy $a_A = \frac{P_H - P_B}{H - L}$ and solving these

equations yields expressions for the prices of the putative equilibrium:^{4.27}

$$P_H = \frac{(2H - 2L - \psi s)(2H\lambda\psi - 2H\lambda - H\psi + 2H - L\lambda\psi + L\lambda + L\psi - L)}{(H - L)(\psi + 2)(2\lambda\psi - 2\lambda - \psi + 2)} \quad (4.D.7)$$

$$P_B = \frac{L(2H - 2L - \psi s)(\lambda\psi - \lambda + 1)}{(H - L)(\psi + 2)(2\lambda\psi - 2\lambda - \psi + 2)} \quad (4.D.8)$$

$$a_A = \frac{2H - 2L - \psi s}{(H - L)(\psi + 2)} \quad (4.D.9)$$

Now taking the difference between P_L and P_B and taking s to zero in the limit. This should be nonnegative by assumption.

$$P_L - P_B = \frac{L\psi(2H\lambda\psi - 2H\lambda - H\psi - 3L\lambda\psi + 3L\lambda + L\psi - L)}{(\psi + 2)(2\lambda\psi - 2\lambda - \psi + 2)(2H\lambda - 2H\lambda\psi + H\psi + 2L\lambda\psi - 2L\lambda)} \quad (4.D.10)$$

First considering the case where $P_L > P_B$ and hence $\lambda = 0$ this difference should be strictly positive. In this case it simplifies to:

$$P_L - P_B = \frac{L(-L - (H - L)\psi)}{H(2 - \psi)(\psi + 2)} \quad (4.D.11)$$

Which is strictly negative. Thus we cannot have an equilibrium where $P_L > P_B$ for a small search cost. Now considering the other case where $P_L = P_B$ and hence $1 \geq \lambda \geq 0$. The difference in equation 4.D.10 must be equal to zero. This is the case if either $\psi = 0$ ^{4.28} or $(2H\lambda\psi - 2H\lambda - H\psi - 3L\lambda\psi + 3L\lambda + L\psi - L) = 0$. This second condition can only hold if $\lambda = \frac{(H-L)\psi+L}{(3L-2H)(1-\psi)}$. The numerator of this equation is always greater than L and the denominator is always less than L . As λ can only be in the range $[0, 1]$ this indicates there is no equilibrium with equal low quality good prices.

Now we guess that $\frac{P_H - P_L + s}{H - L} \geq 1$. Taking first order conditions of equation 4.D.2 and rearranging:

$$P_L = \frac{L(2a_A\lambda\psi - 2a_A\lambda - \psi)}{4\lambda\psi - 4\lambda - 2\psi} \quad (4.D.12)$$

With the reaction functions for P_H and P_B being identical to equations 4.D.5 and 4.D.6. As P_L does not enter these other reaction functions the prices P_H, P_L and a_A in this equilibrium are identical to those given in equations 4.D.7, 4.D.8 and 4.D.9 respectively. P_L can be found by substituting these expressions into equation 4.D.12. Now taking the difference between P_L and P_B and taking s to zero in the limit. This should be nonnegative by assumption.

$$P_L - P_B = -\frac{L\psi(\psi^2 + 4\lambda - 2\lambda\psi^2 - 2\lambda\psi)}{2(\psi + 2)(\psi + 2\lambda(1 - \psi))(2 - 2\lambda(1 - \psi) - \psi)} \quad (4.D.13)$$

Which is negative for all λ . Hence we cannot have an equilibrium where $\frac{P_H - P_L + s}{H - L} \geq 1$ and

^{4.27}The expression for P_L is omitted as it is long but it can be found by substituting equations 4.D.9 and 4.D.7 into equation 4.D.4.

^{4.28}This can be seen intuitively by substituting $\psi = 0$ into equations 4.D.2 and 4.D.3 and taking the first order conditions which are scalar multiples of each other.

$$P_B \leq P_L. \quad \square$$

With $\lambda = 0$ the first order condition for the both firm's low quality good pricing decision becomes:

$$\frac{\partial \pi_B}{\partial P_B} = \psi \left[\frac{P_H - P_B}{H - L} - \frac{P_B}{L} \right] \quad (4.D.14)$$

Which will be positive for a small search cost and $P_B < L$.^{4.29} This implies that the optimal P_B will be equal to $P_L + s$ which is the top of the domain of possible prices satisfying $|P_B - P_L| \leq s$. Note that if the both firm posted a higher price they would experience a discontinuous in sales while the outside option of their consumers would stay the same.

Now using $\lambda = 1$, $a_A = \frac{P_H - P_L}{H - L}$ and $P_B = P_L + s$ and using first order conditions to solve for equilibrium quantities for the case where $\frac{P_H - P_L + s}{H - L} < 1$ as:

$$P_H = \frac{4H^2\psi - 8H^2 - 8HL\psi + 12HL + 2H\psi^2s - 4H\psi s + 4L^2\psi - 4L^2 - 3L\psi^2s}{(\psi + 2)(2H\psi - 4H - 3L\psi + 4L)} \quad (4.D.15)$$

$$P_L = \frac{2L(-H\psi + 2H + L\psi - 2L + 2\psi s)}{(\psi + 2)(4H - 2H\psi + 3L\psi - 4L)} \quad (4.D.16)$$

$$P_B = \frac{2HL\psi - 4HL + 2H\psi^2s - 8Hs - 2L^2\psi + 4L^2 - 3L\psi^2s - 6L\psi s + 8Ls}{(\psi + 2)(2H\psi - 4H - 3L\psi + 4L)} \quad (4.D.17)$$

$$a_A = \frac{2H - 2L + \psi s}{(H - L)(\psi + 2)} \quad (4.D.18)$$

Where a_A approaches 1 as $\psi \rightarrow 0$. This will imply that at some level of ψ we have $\frac{P_H - P_L + s}{H - L} \geq 1$. Now considering this case we can get the equilibrium quantities:

$$P_H = \frac{4H^2\psi - 8H^2 - HL\psi^2 - 6HL\psi + 12HL + 2H\psi^2s - 4H\psi s + L^2\psi^2 + 2L^2\psi - 4L^2 + 2L\psi s}{2(H - L)(\psi - 2)(\psi + 2)} \quad (4.D.19)$$

$$P_L = \frac{L(-H\psi^2 + 2H\psi - 4H + L\psi^2 - 2L\psi + 4L + 2\psi^2s - 2\psi s)}{2(H - L)(\psi - 2)(\psi + 2)} \quad (4.D.20)$$

$$P_B = \frac{(-HL\psi^2 + 2HL\psi - 4HL + 2H\psi^2s - 8Hs + L^2\psi^2 - 2L^2\psi + 4L^2 - 2L\psi s + 8Ls)}{2(H - L)(\psi - 2)(\psi + 2)} \quad (4.D.21)$$

$$a_A = \frac{2H - 2L + \psi s}{(H - L)(\psi + 2)} \quad (4.D.22)$$

Where again a_A approaches 1 as $\psi \rightarrow 0$.

^{4.29}This can be seen by substituting taking the first order condition for the optimal P_H (identical to equation 4.D.5) and substituting this into $\frac{P_H - P_B}{H - L} - \frac{P_B}{L}$ which simplifies to $\frac{1}{\psi} - \frac{P_B}{L} + \frac{a_A}{2} - \frac{s}{2(H - L)}$ which is positive as $\frac{1}{\psi} > 1 > \frac{P_B}{L}$ and s is small.

4.E Many firms in the full information setting

There are $h + l$ firms in a market, h of which sell a product of quality H (the high firms) and l of which sell goods with a lower quality of L (the low firms), where $H > L$. We assume $h > 1$ and $l > 1$ and that all firms produce their goods costlessly. We make the assumption that all firms of a particular quality level sell at the same price. This is done in order for this analysis to arrive at a similar equilibrium to that of section 4.2.1. With these assumption lemmas 1, corollary 2 and lemma 3 carry over with the only modification that directed consumers approach a quality level rather than a specific firm. As before we will denote the ex ante indifferent consumer a_A so consumers with a lower taste approach a low firm and higher taste consumers approach high firms.

$$Q_{\text{High}}(P_H) = \underbrace{\frac{\psi}{h+l} [1 - \max(a_{HL}(P_H), a_H(P_H))]_+}_{\text{Undirected - own}} + \underbrace{\frac{\psi l}{h(h+l)} \left[1 - \max\left(a_A + \frac{s}{H-L}, a_{HL}(P_H), a_H(P_H)\right) \right]_+}_{\text{Undirected runoff from the } L \text{ firm}} + \underbrace{\frac{1-\psi}{h} [1 - \max(a_A, a_{HL}(P_H), a_H(P_H))]_+}_{\text{Directed}} \quad (4.E.1)$$

The demand function for the low firm can be written as:

$$Q_{\text{Low}}(P_L) = \underbrace{\frac{\psi}{h+l} [\min(1, a_T(P_L)) - a_L(P_L)]_+}_{\text{Undirected - own}} + \underbrace{\frac{\psi l}{h(h+l)} \left[\min\left(a_A - \frac{s}{H-L}, a_T(P_L)\right) - \max(a_{HLM}, a_L(P_L)) \right]_+}_{\text{Undirected Runoff from the } H \text{ firm}} + \underbrace{\frac{1-\psi}{h} [\min(a_A, a_T(P_L)) - a_L(P_L)]_+}_{\text{Directed}} \quad (4.E.2)$$

As before we examine the case when the search costs are sufficiently low that the high firm's marginal consumer is indifferent to the low firm.

$$Q_{\text{High}}(P_H) = \underbrace{\frac{\psi}{h+l} [1 - a_H(P_H)]_+}_{\text{Undirected - own}} + \underbrace{\frac{\psi l}{h(h+l)} \left[1 - \left(a_A + \frac{s}{H-L}\right) \right]_+}_{\text{Undirected runoff from the } L \text{ firm}} + \underbrace{\frac{1-\psi}{h+l} [1 - a_A]}_{\text{Directed}} \quad (4.E.3)$$

Case A: $a_T < 1$

Now assuming $a_T < 1$ we can rewrite the low firm's demand function as:

$$Q_{\text{Low}}(P_L) = \underbrace{\frac{\psi}{2} [a_T(P_L) - a_L(P_L)]_+}_{\text{Undirected - own}} + \underbrace{\frac{\psi}{2} \left[a_A - \frac{s}{H-L} - a_{HLM} \right]_+}_{\text{Undirected Runoff from the } H \text{ firm}} \quad (4.E.4)$$

And we can solve to get:

$$\begin{aligned}
P_H &= \frac{2H^2h^2 + 3H^2hl\psi + H^2l^2\psi^2 + HLh^2\psi - 3HLh^2 + HLhl\psi^2 - 4HLhl\psi - HLI^2\psi^2 + 2Hh^2\psi s + Hhl\psi^2s - 3Hhl\psi s - 2HI^2\psi^2s - L^2h^2\psi}{2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi^2 - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2} \\
&\quad + \frac{L^2h^2 - L^2hl\psi^2 + L^2hl\psi + Lh^2\psi^2s + Lhl\psi s}{2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi^2 - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2} \\
P_L &= \frac{HLh^2 + 2HLhl\psi + HLI^2\psi^2 - Hhl\psi^2s - Hhl\psi s - HI^2\psi^2s - L^2h^2 - 2L^2hl\psi - L^2l^2\psi^2 + Lh^2\psi^2s + 2Lh^2\psi s + 2Lhl\psi^2s - Lhl\psi s - LI^2\psi^2s}{2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi^2 - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2} \\
\pi_H &= \frac{\psi}{(H-L)(h+l) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi^2 - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2 \right)^2} \left[2H^2h^2 + 3H^2hl\psi + H^2l^2\psi^2 \right. \\
&\quad \left. + HLh^2\psi + HLhl\psi^2 - 3HLh^2 - 4HLhl\psi - HLI^2\psi^2 + 2Hh^2\psi s + Hhl\psi^2s - 3Hhl\psi s - 2HI^2\psi^2s - L^2h^2\psi + L^2h^2 - L^2hl\psi^2 \right. \\
&\quad \left. + L^2hl\psi + Lh^2\psi^2s + Lhl\psi s \right]^2 \\
\pi_L &= \frac{(H+L\psi-L)}{L(H-L)(h+l) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi^2 - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2 \right)^2} \left[HLh^2 \right. \\
&\quad \left. + 2HLhl\psi + HLI^2\psi^2 - Hhl\psi^2s - Hhl\psi s - HI^2\psi^2s - L^2h^2 - 2L^2hl\psi - L^2l^2\psi^2Lh^2\psi^2s + 2Lh^2\psi s + 2Lhl\psi^2s - Lhl\psi s - LI^2\psi^2s \right]^2 \\
a_A &= \frac{2Hh^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2 + 2h^2\psi s + 2hl\psi^2s - 2hl\psi s - l^2\psi^2s}{2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi^2 - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2} \quad (4.E.5) \\
a_T &= \frac{H^2l\psi(3h+l\psi) - HLh^2(4-\psi) + 2H^2h^2 - HLhl\psi(6-\psi) - 2H(LI^2\psi^2 + h^2s) + Hhl\psi s(\psi-5) - \psi(2HI^2\psi^2s + L^2h^2)}{(H-L) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi^2 - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2 \right)} \\
&\quad + \frac{L^2h(2h-l\psi^2) + L^2l\psi(3h+l\psi) - Lh^2\psi s(\psi+2) - Lhs(3l\psi^2 - 2h) + Ll\psi s(5H+2l\psi)}{(H-L) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 + Lh^2\psi^2 - 2Lh^2 + Lhl\psi^2 - 3Lhl\psi - LI^2\psi^2 \right)}
\end{aligned}$$

Case B: $a_T \geq 1$

Now assuming $a_T \geq 1$ we can rewrite the low firm's demand function as:

$$Q_{\text{Low}}(P_L) = \underbrace{\frac{\psi}{2} [1 - a_L(P_L)]}_{\text{Undirected - own}} + \underbrace{\frac{\psi}{2} \left[a_A - \frac{s}{H-L} - a_{HLM} \right]}_{\text{Undirected Runoff from the } H \text{ firm}} \quad (4.E.6)$$

And we can solve to get:

$$\begin{aligned}
P_H &= \frac{2H^2h^2 + 3H^2hl\psi + H^2l^2\psi^2 - 3HLh^2 - 4HLhl\psi - HLI^2\psi^2 + 2Hh^2\psi s + Hhl\psi^2s - 3Hhl\psi s - 2HI^2\psi^2s}{2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2} \\
&\quad + \frac{L^2h^2 + L^2hl\psi - Lh^2\psi^2s - Lh^2\psi s + Lhl\psi^2s + Lhl\psi s}{2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2} \\
P_L &= \frac{HLh^2\psi^2 + HLh^2 + 2HLhl\psi + HLI^2\psi^2 - Hhl\psi^2s - Hhl\psi s - HI^2\psi^2s - L^2h^2\psi^2 - L^2h^2}{2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2} \\
&\quad + \frac{Lh^2\psi s - 2L^2hl\psi - L^2l^2\psi^2 - Lh^2\psi^2s + 2Lhl\psi^2s - Lhl\psi s - LI^2\psi^2s}{2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2} \\
\pi_H &= \frac{\psi}{(H-L)(h+l) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2 \right)^2} \left[2H^2h^2 + 3H^2hl\psi - 3HLh^2 \right. \\
&\quad \left. + HI^2\psi^2 - 4HLhl\psi - HLI^2\psi^2 + 2Hh^2\psi s + Hhl\psi^2s - 3Hhl\psi s - 2HI^2\psi^2s + L^2h^2 + L^2hl\psi - Lh^2\psi^2s - Lh^2\psi s + Lhl\psi^2s + Lhl\psi s \right]^2 \\
\pi_L &= \frac{1}{L(h+l) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2 \right)^2} \left[Hhl\psi^2s - HLh^2\psi^2 - HLh^2 \right. \\
&\quad \left. - 2HLhl\psi - HLI^2\psi^2 + Hhl\psi s + HI^2\psi^2s + L^2h^2\psi^2 + L^2h^2 + 2L^2hl\psi + L^2l^2\psi^2 + Lh^2\psi^2s - Lh^2\psi s - 2Lhl\psi^2s + Lhl\psi s + LI^2\psi^2s \right]^2 \\
a_A &= \frac{2H^2h^2 + 3H^2hl\psi + H^2l^2\psi^2 - HLh^2\psi^2 - 4HLh^2 - 6HLhl\psi - 2HLI^2\psi^2 + 2Hh^2\psi s + 2Hhl\psi^2s - 2Hhl\psi s - HI^2\psi^2s}{(H-L) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2 \right)} \quad (4.E.7) \\
&\quad + \frac{L^2h^2\psi^2 + 2L^2h^2 + 3L^2hl\psi + L^2l^2\psi^2 - 2Lh^2\psi s - Lhl\psi^2s + 2Lhl\psi s + LI^2\psi^2s}{(H-L) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2 \right)} \\
a_T &= \frac{H\psi^2(HI^2 - Lh^2) - HLh(4h+6l\psi) + H^2h(2h+3l\psi) - 2H(LI^2\psi^2 + h^2s) - Hhl\psi s(5-\psi) - 2HI^2\psi^2s + L^2h^2\psi^2 + 2L^2h^2 + 3L^2hl\psi}{(H-L) \left(2Hh^2\psi + 2Hh^2 + Hhl\psi^2 + 3Hhl\psi + HI^2\psi^2 - Lh^2\psi^2 - Lh^2\psi - 2Lh^2 - 3Lhl\psi - LI^2\psi^2 \right)}
\end{aligned}$$

As $\psi \rightarrow 0$

As $\psi \rightarrow 0$ we get a_A as defined by equation 4.E.5 approaching 1.^{4.30} This indicates that as $\psi \rightarrow 0$ we get a_T going above a_A and hence the second case will arise. As $\psi \rightarrow 0$ we get a_A as defined by equation 4.E.7 approaching 1.

Thus in a similar result to proposition 3, the low quality firms take over the market in the full information as the number of directed consumers increases.

4.F Three Levels of Quality in the Market

The top firm has a quality of H . The middle firm has a quality of M and the lower firm has a quality of L . The ex ante indifferent consumers between the low and middle quality firms have a taste denoted a_A while the ex ante indifferent consumers between the high and middle quality firms have a taste denoted a_{A2} . There are γ firms in total, β lower quality firms and α middle quality firms and so $\gamma - \alpha - \beta$ high quality firms.

By setting up expressions similar to equation 4.3 and rearranging, we can derive expressions for the indifferent taste consumers at each firm. These can be seen in table 4.F.1:

Notation	Location of consumer	Indifferent between	Formula
a_A	Ex Ante	Going to medium and low firm	$\frac{P_M^E - P_L^E}{M - L}$
a_{A2}	Ex Ante	Going to high and medium firm	$\frac{P_H^E - P_M^E}{H - M}$
a_H	High firm	Buying and going to medium firm	$\frac{P_H - P_M^E - s}{H - M}$
a_{HLeave}	High firm	Going to low firm and leaving market	$\frac{P_L^E + s}{L}$
a_{MH}	Medium firm	Buying and going to high firm	$\frac{P_H^E - P_M + s}{H - M}$
a_M	Medium firm	Buying and going to low firm	$\frac{P_M - P_L^E - s}{M - L}$
a_{MLeave}	Medium firm	Going to low firm and leaving market	$\frac{P_L^E + s}{L}$
a_{LM}	Low firm	Buying and going to medium firm	$\frac{P_M^E - P_L + s}{M - L}$
a_L	Low firm	Buying and leaving market	$\frac{P_L}{L}$

Table 4.F.1: Indifferent Consumers for model with three quality levels

Now we will examine the putative equilibria where s is small. We shall suppose that the search cost is sufficiently low that all of the following hold. The best outside for the marginal consumer at a high firm is to go to a medium firm, the best outside option for the highest taste marginal consumer at a medium firm is to go to a high firm. The best outside option for the bottom taste marginal consumer at a medium firm is to go to a low firm. The top and bottom marginal consumers at the low firm will go to a medium firm/ leave market respectively.

^{4.30}This can be seen by substituting $\psi = 0$ into the equation and noting the feasible range of a_A is the closed interval between 0 and 1.

We write profit functions for each firm starting with the low firms:

$$\begin{aligned} \text{Quantity}_L(P_L) = & \overbrace{\frac{\psi}{\gamma} [\min(1, a_{LM}(P_L)) - a_L(P_L)]_+}^{\text{Undirected - own}} + \overbrace{\frac{\psi \frac{\alpha}{\gamma}}{\beta} \left[a_A - \frac{s}{M-L} - a_L(P_L) \right]_+}^{\text{Undirected Runoff from the middle firms}} \\ & + \overbrace{\frac{\psi \frac{\gamma-\beta-\alpha}{\gamma}}{\beta} [a_A - a_L(P_L)]_+}^{\text{Undirected Runoff from the top firms}} + \overbrace{\frac{(1-\psi)}{\beta} [a_A - a_L(P_L)]_+}^{\text{Directed}} \end{aligned}$$

Now writing the demand function for the medium firms:

$$\begin{aligned} \text{Quantity}_M(P_M) = & \overbrace{\frac{\psi}{\gamma} [\min(1, a_{MH}(P_M)) - a_M(P_M)]_+}^{\text{Undirected - own}} + \overbrace{\frac{\psi \frac{\beta}{\gamma}}{\alpha} \left[a_{A2} - \max(a_A + \frac{s}{M-L}, a_M(P_M)) \right]_+}^{\text{Undirected Runoff from the bottom firms}} \\ & + \overbrace{\frac{\psi \frac{(\gamma-\alpha-\beta)}{\gamma}}{\alpha} \left[a_{A2} - \frac{s}{H-M} - \max(a_A, a_M(P_M)) \right]_+}^{\text{Undirected Runoff from the top firms}} \\ & + \overbrace{\frac{(1-\psi)}{\alpha} [a_{A2} - \max(a_A, a_M(P_M))]_+}^{\text{Directed}} \end{aligned}$$

Now writing the demand function for the high firms:

$$\begin{aligned} \text{Quantity}_H(P_H) = & \overbrace{\frac{\psi}{\gamma} [1 - a_H(P_H)]_+}^{\text{Undirected - own}} + \overbrace{\frac{\psi \frac{\beta}{\gamma}}{\gamma - \alpha - \beta} [1 - \max(a_{A2}, a_H(P_H))]_+}^{\text{Undirected Runoff from the bottom firms}} \\ & + \overbrace{\frac{\psi \frac{\alpha}{\gamma}}{\gamma - \alpha - \beta} \left[1 - \max(a_{A2} + \frac{s}{H-M}, a_H(P_H)) \right]_+}^{\text{Undirected Runoff from the medium firms}} \\ & + \overbrace{\frac{(1-\psi)}{\gamma - \alpha - \beta} [1 - \max(a_{A2}, a_H(P_H))]_+}^{\text{Directed}} \end{aligned}$$

Algebra

The sympy package of python was used to solve for equilibrium values $P_L, P_M, P_H, a_A, a_{A2}$. The code to do this can be seen on the following pages. It can be found that in the case $a_{MH} < 1$ & $a_{LM} < 1$, the case $a_{MH} < 1$ & $a_{LM} < 1$ and the case $a_{MH} > 1$ & $a_{LM} > 1$ we have $a_A \rightarrow 1$ and $a_{A2} \rightarrow 1$ as $\psi \rightarrow 0$.^{4.31}

```
'''
Paper: It's Good to be Bad: A model of low quality dominance in a full information consumer search
market
Author: Stuart Baumann & Margaryta Klymak
Date: 6th of April 2017
Comments: This code solves the model where there are three quality levels as occurs when there are many
firms only some of which may disclose. Version 1.0 of sympy is used.
'''
# Preparing workspace and declaring variables
%reset -f
```

^{4.31}Output of the code is not shown as the expressions are complicated and occupy many pages. Should you wish to replicate these results please find the python code on the author's (Baumann) website.

```

import sympy as sy
H, M, L, psi, a_A, a_A2, s, p_L, p_M, p_H, alpha, beta, gamma = sy.symbols('H M L psi a_A a_{A2} s p_L
p_M p_H alpha beta gamma')

# Writing Function to solve for equilibrium.
def GetEquilibrium(LowDemandExpr, MedDemandExpr, HighDemandExpr):
    global H, M, L, psi, a_A, a_A2, s, p_L, p_M, p_H, alpha, beta, gamma
    # Getting Reaction Functions
    LowPi = LowDemandExpr*p_L
    LowReactionFunction = next(iter(sy.solve(sy.diff(LowPi, p_L), p_L)))
    MedPi = MedDemandExpr*p_M
    MedReactionFunction = next(iter(sy.solve(sy.diff(MedPi, p_M), p_M)))
    HighPi = HighDemandExpr*p_H
    HighReactionFunction = next(iter(sy.solve(sy.diff(HighPi, p_H), p_H)))

    # Ex Ante Indifferent Consumers
    ExAnteIndifferent = {a_A: (p_M-p_L)/(M-L), a_A2: (p_H-p_M)/(H-M) }
    # Sub in a_A and a_A2
    LowFunction2 = LowReactionFunction.subs(ExAnteIndifferent)
    MedFunction2 = MedReactionFunction.subs(ExAnteIndifferent)
    HighFunction2 = HighReactionFunction.subs(ExAnteIndifferent)

    # Solving to get each as function of other two
    LowFunction3 = next(iter(sy.solve(sy.solve(LowFunction2 - p_L, p_L)))
    MedFunction3 = next(iter(sy.solve(sy.solve(MedFunction2 - p_M, p_M)))
    HighFunction3 = next(iter(sy.solve(sy.solve(HighFunction2 - p_H, p_H)))

    # Eliminate Low price from other two.
    MedFunction4 = next(iter(sy.solve(sy.solve(MedFunction3.subs(p_L, LowFunction3) - p_M, p_M)))
    HighFunction4 = next(iter(sy.solve(sy.solve(HighFunction3.subs(p_L, LowFunction3) - p_H, p_H)))

    # Sub MedFunction4 into HighFunction4 to get expression for high price. Then get medium and low
    prices
    RawHighPrice = next(iter(sy.solve(sy.solve(HighFunction4.subs(p_M, MedFunction4) - p_H,
p_H)))
    RawMedPrice = next(iter(sy.solve(sy.solve(MedFunction4.subs(p_H, RawHighPrice) - p_M,
p_M)))
    RawLowPrice = next(iter(sy.solve(sy.solve(LowFunction3.subs({p_H:RawHighPrice, p_M:RawMedPrice}) - p_L,
p_L)))

    # Simplifying prices
    LowPrice = sy.factor(sy.simplify(RawLowPrice))
    MedPrice = sy.factor(sy.simplify(RawMedPrice))
    HighPrice = sy.factor(sy.simplify(RawHighPrice))

    # Getting expressions for ex ante indifferent consumers
    a_AExpr = sy.factor(sy.simplify((MedPrice - LowPrice)/(M-L)))
    a_A2Expr = sy.factor(sy.simplify((HighPrice - MedPrice)/(H-M)))

    # What do a_A and a_A2 tend to as $psi \rightarrow 0$. Note that direct substitution is ok
    # as expressions will be continuous
    a_ALowPsi = sy.factor(sy.simplify(a_AExpr.subs(psi,0)))
    a_A2LowPsi = sy.factor(sy.simplify(a_A2Expr.subs(psi,0)))

    # Dictionary To Return
    EquilibriumValues = {'p_L': LowPrice, 'p_M': MedPrice, 'p_H': HighPrice, 'a_A': a_AExpr, 'a_A2':
a_A2Expr,
'a_ALimit': a_ALowPsi, 'a_A2Limit': a_A2LowPsi }

    # Returning Equilibrium Values
    return(EquilibriumValues)

# Case 1: This is guessing for the low and medium firms that the 1 never binds in the min function.
LowDemandExpr = (psi/gamma)*((p_M - p_L + s)/(M-L) - p_L/L) + ((psi*alpha)/(gamma*beta))*(a_A - s/(M-L)
)- p_L/L + ((psi*(gamma-beta-alpha))/(gamma*beta))*(a_A - p_L/L) + ((1-psi)/(beta))*(a_A - p_L/L)
MedDemandExpr = (psi/gamma)*((p_M - p_H - s)/(M-H) - (p_M - p_L - s)/(M-L)) + ((psi*beta)/(gamma*alpha)
)*(a_A2 - a_A - s/(M-L)) + ((psi*(gamma-beta-alpha))/(gamma*alpha))*(a_A2 - s/(H-M) - a_A) + ((1-
psi)/(alpha))*(a_A2 - a_A)
HighDemandExpr = (psi/gamma)*(1 - (p_H - p_M - s)/(H-M)) + ((psi*beta)/(gamma*(gamma-alpha-beta)))*(1 -
a_A2) + ((psi*alpha)/(gamma*(gamma-alpha-beta)))*(1 - a_A2 - s/(H-M)) + ((1-psi)/(gamma-alpha-beta)
)*(1 - a_A2)
EqCase1 = GetEquilibrium(LowDemandExpr, MedDemandExpr, HighDemandExpr)

# Case 2: We have a_{MH} > 1 but a_{LM} < 1
LowDemandExpr = (psi/gamma)*((p_M - p_L + s)/(M-L) - p_L/L) + ((psi*alpha)/(gamma*beta))*(a_A - s/(M-L)
)- p_L/L + ((psi*(gamma-beta-alpha))/(gamma*beta))*(a_A - p_L/L) + ((1-psi)/(beta))*(a_A - p_L/L)

```

```

MedDemandExpr = (psi/gamma)*(1 - (p_M - p_L - s)/(M-L)) + ((psi*beta)/(gamma*alpha))*(a_A2 - a_A - s/(M-L)) + ((psi*(gamma-beta-alpha))/(gamma*alpha))*(a_A2 - s/(H-M) - a_A) + ((1-psi)/(alpha))*(a_A2 - a_A)
HighDemandExpr = (psi/gamma)*(1 - (p_H - p_M - s)/(H-M)) + ((psi*beta)/(gamma*(gamma-alpha-beta)))*(1 - a_A2) + ((psi*alpha)/(gamma*(gamma-alpha-beta)))*(1 - a_A2 - s/(H-M)) + ((1-psi)/(gamma-alpha-beta))*(1 - a_A2)
EqCase2 = GetEquilibrium(LowDemandExpr, MedDemandExpr, HighDemandExpr)

# Case 3: We have a_{MH} > 1 and a_{LM} > 1
LowDemandExpr = (psi/gamma)*(1 - p_L/L) + ((psi*alpha)/(gamma*beta))*(a_A - s/(M-L) - p_L/L) + ((psi*(gamma-beta-alpha))/(gamma*beta))*(a_A - p_L/L) + ((1-psi)/(beta))*(a_A - p_L/L)
MedDemandExpr = (psi/gamma)*(1 - (p_M - p_L - s)/(M-L)) + ((psi*beta)/(gamma*alpha))*(a_A2 - a_A - s/(M-L)) + ((psi*(gamma-beta-alpha))/(gamma*alpha))*(a_A2 - s/(H-M) - a_A) + ((1-psi)/(alpha))*(a_A2 - a_A)
HighDemandExpr = (psi/gamma)*(1 - (p_H - p_M - s)/(H-M)) + ((psi*beta)/(gamma*(gamma-alpha-beta)))*(1 - a_A2) + ((psi*alpha)/(gamma*(gamma-alpha-beta)))*(1 - a_A2 - s/(H-M)) + ((1-psi)/(gamma-alpha-beta))*(1 - a_A2)
EqCase3 = GetEquilibrium(LowDemandExpr, MedDemandExpr, HighDemandExpr)

```

Chapter 5

Conclusion

This dissertation presented two empirical chapters and one theoretical chapter. Chapter two examined whether information provision about the usage of child and forced labor in the production of goods deterred imports of these goods to the United States. Chapter three investigated the impact of foreign competition on the reallocation of unpaid and household labor in the context of Vietnam, a fast-growing developing country. Chapter four examined the case when the information revelation can be harmful for the efficiency of search markets.

In chapter two I did not find a statistically significant (negative) impact of the information about child and forced labor on the U.S. imports. This result remained unchanged when the data were disaggregated by the stage of production and by sector. This drives the chapter's major policy conclusion that listing will not incentivise countries from using child and forced labor. This finding suggests that more direct measures may be required to deter forced and child labor. These results show that the concerns raised by a number of listed goods governments about the effect of TVPRA listing on trade are unsupported.

The finding of chapter three was that as foreign competition increases family and unpaid labor are more likely to leave household firms in order to work elsewhere. The results were largely driven by less financially stable enterprises. This is important information for policy makers in developing countries for understanding how economic integration can affect the employment structure of household firms.

Chapter four shows when the quality of goods is known to consumers, the only refined equilibria is one where all consumers approach low quality firms and high quality firms make no sales. However, when quality of goods is unknown in this model, high and low quality firms split the market and make equal profit. A key takeaway from the chapter is that having a low quality reputation can provide an advantage for a firm. This chapter gives two important insights. First, while low quality

disclosure can be beneficial for low quality firms, it can negatively affect total welfare. Second, when quality is endogenised, firms will undercut each other in quality leading to lower quality goods being offered to consumers. A policy implication of this chapter is that it might be beneficial for the markets with search frictions to impose minimum quality standards.

Bibliography

- Abbott, Philip, and Finn Tarp.** 2011. “Globalization crises, trade, and development in Vietnam.” *UNU-WIDER Working Paper 20/2011*.
- AboveTheLaw.com.** 2012. “Adventures in lawyer advertising: battle of the Hammers.” <http://abovethelaw.com/2012/09/adventures-in-lawyer-advertising-battle-of-the-hammers/> (accessed August 14, 2018).
- Acemoglu, Daron, David Autor, David Dorn, Gordon H. Hanson, and Brendan Price.** 2016. “Import competition and the great US employment sag of the 2000s.” *Journal of Labor Economics*, 34(S1): 141–198.
- Akerlof, George A.** 1970. “The market for lemons: quality uncertainty and the market mechanism.” *Quarterly Journal of Economics*, 84(3): 488–500.
- Alba, Joseph, and Howard Marmorstein.** 1987. “The effects of frequency knowledge on consumer decision making.” *Journal of Consumer Research*, 14(1): 14–25.
- American Bar Association.** 2016. “ABA aspirational goals for lawyer advertising.” http://www.americanbar.org/groups/professional_responsibility/resources/professionalism/professionalism_ethics_in_lawyer_advertising/abaaspirationalgoals.html (accessed August 14, 2018).
- Anderson, James E.** 1979. “A theoretical foundation for the gravity equation.” *American Economic Review*, 69(1): 106–116.
- Anderson, James E., and Eric van Wincoop.** 2003. “Gravity with gravitas: a solution to the border puzzle.” *American Economic Review*, 93(1): 170–192.
- Asian Development Bank.** 2015. “Asia small and medium-sized enterprise (SME) finance monitor 2014.” <https://www.adb.org/publications/asia-sme-finance-monitor-2014> (accessed August 14, 2018).
- Attanasio, Orazio, Pinelopi K. Goldberg, and Nina Pavcnik.** 2004. “Trade reforms and wage inequality in Colombia.” *Journal of Development Economics*, 74(2): 331–366.

- Autor, David H., David Dorn, and Gordon H. Hanson.** 2013. "The China syndrome: local labor market effects of import competition in the United States." *American Economic Review*, 103(6): 2121–2168.
- Autor, David H., David Dorn, Gordon H. Hanson, and Jae Song.** 2014. "Trade adjustment: worker-level evidence." *Quarterly Journal of Economics*, 129(4): 1799–1860.
- Baccini, Leonardo, Giammario Impullitti, and Edmund J Malesky.** 2017. "Globalization and state capitalism: assessing Vietnam's accession to the WTO." *CESifo Working Paper no. 6618*.
- Bagwell, Kyle, and Michael Riordan.** 1991. "High and declining prices signal product quality." *American Economic Review*, 81(1): 224–239.
- Baines, Susan, and Jane Wheelock.** 1998. "Working for each other: gender, the household and micro-business survival and growth." *International Small Business Journal*, 17(1): 16–35.
- Baker, Julie, A. Parasuraman, Dhruv Grewal, and Glenn Voss.** 2002. "The influence of multiple store environment cues on perceived merchandise value and patronage intentions." *Journal of Marketing*, 66(2): 120–141.
- Baland, Jean-Marie, and Cédric Duprez.** 2009. "Are labels effective against child labor?" *Journal of Public Economics*, 93(11-12): 1125–1130.
- Balsvik, Ragnhild, Sissel Jensen, and Kjell G. Salvanes.** 2015. "Made in China, sold in Norway: local labor market effects of an import shock." *Journal of Public Economics*, 127: 137–144.
- Bangalore Rural Educational and Development Society.** 2013. "Educate 100 rescued girl child labourers." <http://www.breadsbangalore.org> (accessed August 14, 2018).
- Barber, Brad M., and Masako N. Darrough.** 1996. "Product reliability and firm value: the experience of American and Japanese automakers, 1973-1992." *Journal of Political Economy*, 104(5): 1084–1099.
- Barrett, Christopher B., Thomas Reardon, and Patrick Webb.** 2001. "Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications." *Food Policy*, 26(4): 315–331.
- Basu, Arnab K., Nancy H. Chau, and Ulrike Grote.** 2006. "Guaranteed manufactured without child labor: the economics of consumer boycotts, social labeling and trade sanctions." *Review of Development Economics*, 10(10): 466–491.
- Basu, Kaushik.** 1999. "Child labor: cause, consequence, and cure, with remarks on international labor standards." *Journal of Economic Literature*, 37(3): 1083–1119.

- Basu, Kaushik.** 2001. "International labor standards and child labor." *Globalization, institutions and social cohesion*, , ed. F. R. Pizzuti and M. Franzini, Chapter 7, 115–123. Berlin, Heidelberg:Berlin; New York: Springer.
- Basu, Kaushik.** 2003. "Policy dilemmas for controlling child labor." Cornell University, Center for Analytic Economics Working Papers 03-11.
- Bertrand, Joseph.** 1883. "Book review of *theorie mathematique de la richesse sociale* and of *recherches sur les principes mathematiques de la theorie des richesses*." *Journal de Savants*, 67(3): 499–508.
- Birchall, Jonathan.** 2008. "Wal-Mart boycotts Uzbek cotton." *Financial Times*. <https://www.ft.com/content/1362991c-8f07-11dd-946c-0000779fd18c?mhq5j=e2> (accessed August 14, 2018).
- Bloom, Nicholas, and John Van Reenen.** 2007. "Measuring and explaining management practices across firms and countries." *Quarterly Journal of Economics*, 122(4): 1351–1408.
- Board, Oliver.** 2009. "Competition and disclosure." *Journal of Industrial Economics*, LVII(1): 197–213.
- Bonnal, Michaël.** 2010. "Export performance, labor standards and institutions: evidence from a dynamic panel data model." *Journal of Labor Research*, 31(1): 53–66.
- Borjas, George J., and Valerie A. Ramey.** 1995. "Foreign competition, market power, and wage inequality." *Quarterly Journal of Economics*, 110(4): 1075–1110.
- Brand-Weiner, Ian, and Francesca Francavilla.** 2015. "Income mobility in times of economic growth: The case of Viet Nam." OECD Development Centre Working Paper 328.
- Brookfield, Harold, and Helen Parsons.** 2007. *Family farms: survival and prospect. A world-wide analysis*. Routledge.
- Brown, Drusilla, K.** 2001. "Labor standards: where do they belong on the international trade agenda?" *Journal of Economic Perspectives*, 15(3): 89–112.
- Brown, Francis.** 1969. "Price image versus price reality." *Journal of Marketing Research*, 6(2): 185–191.
- Busse, Matthias.** 2002. "Do labor standards affect comparative advantage in developing countries?" *World Development*, 30(11): 1921–1932.
- Caldieraro, Fabio, Dongsoo Shin, and Andrew Stivers.** 2011. "Voluntary quality disclosure under price-signalling competition." *Managerial and decision economics*, 32(8): 493–504.
- Caliendo, Lorenzo, Maximiliano Dvorkin, and Fernando Parro.** 2015. "The impact of trade on labor market dynamics." National Bureau of Economic Research Working Paper 21149.

- Carlier, Amanda S., and Son Thanh Tran.** 2004. "Firm dynamism: beyond registration. How are Vietnam new domestic private firms faring?" Viettinam Private Sector Development Policy Note 30434.
- Chakrabarty, Sayan, and Ulrike Grote.** 2009. "Child labor in carpet weaving: impact of social labeling in India and Nepal." *World Development*, 37(10): 1683–1693.
- Cision.** 2016. "Top 10 US daily newspapers." <http://www.cision.com/us/2014/06/top-10-us-daily-newspapers/> (accessed August 14, 2018).
- Clerides, Sofronis, Peter Davis, and Antonis Michis.** 2015. "National sentiment and consumer choice: the Iraq War and sales of US products in Arab countries." *The Scandinavian Journal of Economics*, 117(3): 829–851.
- Cling, Jean-Pierre, Mireille Razafindrakoto, and François Roubau.** 2011. *The informal economy in Viet Nam*. Ministry of Labour, Invalids, and Social Affairs.
- Comtrade UN Statistics Division.** 2018. "Comtrade international trade data." <http://comtrade.un.org/> (accessed August 14, 2018).
- Daughety, Andrew, and Jennifer Reinganum.** 2008. "Communicating quality: a unified model of disclosure & signalling." *RAND Journal of Economics*, 39(4): 973–989.
- Dehejia, Vivek H, and Yiagadeesen Samy.** 2004. "Trade and labour standards: theory and new empirical evidence." *The Journal of International Trade & Economic Development*, 13(2): 179–198.
- DellaVigna, Stefano, and Eliana La Ferrara.** 2010. "Detecting illegal arms trade." *American Economic Journal: Economic Policy*, 2: 26–57.
- Deolalikar, Anil B., and Wim P. M. Vijverberg.** 1987. "A test of heterogeneity of family and hired labour in Asian agriculture." *Oxford Bulletin of Economics and Statistics*, 49(3): 291–305.
- Diamond, Peter A.** 1971. "A model of price adjustment." *Journal of Economic Theory*, 3(2): 156–168.
- Dickson, Marsha A.** 2001. "Utility of no sweat labels for apparel consumers: profiling label users and predicting their purchases." *Journal of Consumer Affairs*, 35(1): 196–119.
- Dix-Carneiro, Rafael.** 2014. "Trade liberalization and labor market dynamics." *Econometrica*, 82(3): 825–885.
- Dranove, David, and Ginger Zhe Jin.** 2010. "Quality disclosure and certification: theory and practice." *Journal of Economic Literature*, 48(4): 935–963.

- Durrani, Anayat.** 2011. “Lawyer advertising: A. reaches new heights or B. sinks to new depths.” *Plaintiff Magazine*. <https://www.plaintiffmagazine.com/item/lawyer-advertising-a-reaches-new-heights-or-b-sinks-to-new-depths> (accessed August 14, 2018).
- Edmonds, Eric V., and Nina Pavcnik.** 2005. “Child labor in the global economy.” *Journal of Economic Perspectives*, 19(1): 199–220.
- Edmonds, Eric V., and Nina Pavcnik.** 2006. “Trade liberalization and the allocation of labor between households and markets in a poor country.” *Journal of International Economics*, 69(2): 272 – 295.
- Ellis, Frank.** 2000. *Rural livelihoods and diversity in developing countries*. New York: Oxford University Press.
- European Commission.** 2013. “Trade and worst forms of child labour.” *Commission Staff Working Document*, 173. https://ec.europa.eu/anti-trafficking/eu-policy/trade-and-worst-forms-child-labour_en (accessed August 14, 2018).
- Federal Register.** 2006. “Trafficking victims protection reauthorization act of 2005.” <http://www.state.gov/j/tip/laws/61106.htm> (accessed August 14, 2018).
- Feliciano, Zadia M.** 2001. “Workers and trade liberalization: the impact of trade reforms in Mexico on wages and employment.” *Industrial and Labor Relations Review*, 55(1): 95–115.
- Ford.** 2014. “Sustainability report 2013/14.” <http://corporate.ford.com/microsites/sustainability-report-2013-14/supply-materials-trafficking.html> (accessed August 14, 2018).
- Freeman, Richard B.** 1994. “A hard-headed look at labor standards.” *International Labour Standards in the Globalized Economy: Issues, Challenges and Perspectives*, 78–92. Geneva, Switzerland: ILO for the International Institute for Labour Studies NIO Programme.
- Fuchs, Andreas, and Nils-Hendrik Klanna.** 2013. “Paying a visit: the Dalai Lama effect on international trade.” *Journal of International Economics*, 91(1): 164–177.
- Fukase, Emiko.** 2013. “Export liberalization, job creation, and the skill premium: evidence from the US-Vietnam bilateral trade agreement (BTA).” *World Development*, 41: 317–337.
- Galenianos, Manolis, and Alessandro Gavazza.** 2017. “A structural model of the retail market for illicit drugs.” *American Economic Review*, 107(3): 858–896.
- Glazer, Amihai, Vesa Kanninen, and Panu Poutvaara.** 2010. “Firms’ ethics, consumer boycotts, and signalling.” *European Journal of Political Economy*, 26(3): 340–350.

- Gowen, Annie, and Rama Lakshmi.** 2014. “Peace Prize recipient Kailash Satyarthi has long campaigned against child labor.” https://www.washingtonpost.com/world/asia_pacific/peace-prize-recipient-kailash-satyarthi-has-long-campaigned-against-child-labor/2014/10/10/358956aa-5078-11e4-877c-335b53ffe736_story.html (accessed August 14, 2018).
- Grossman, Sanford J.** 1981. “The informational role of warranties and private disclosure about product quality.” *Journal of Law and Economics*, 24(3): 461–483.
- Haggblade, Steven, Peter B. R. Hazell, and Thomas Anthony Reardon,** ed. 2007. *Transforming the rural nonfarm economy: opportunities and threats in the developing world. IFPRI books*, International Food Policy Research Institute.
- Hamilton, Ryan, and Alexander Chernev.** 2013. “Low prices are just the beginning: price image in retail management.” *Journal of Marketing*, 77(6): 1–20.
- Harrison, Ann, and Jason Scorse.** 2010. “Multinationals and anti-sweatshop activism.” *American Economic Review*, 100(1): 247–273.
- Heda, Sandeep, Stephen Mewborn, and Stephen Caine.** 2017. “How customers perceive a price is as important as the price itself.” *Harvard Business Review*. <https://hbr.org/2017/01/how-customers-perceive-a-price-is-as-important-as-the-price-itself> (accessed August 14, 2018).
- Hoekman, Bernard M.** 2005. “Trade and employment: stylized facts and research findings.” *World Bank - Policy Research Working Paper*, WPS3676: 1–37.
- Hombert, Johan, and Adrien Matray.** forthcoming. “Can innovation help U.S. manufacturing firms escape import competition from China?” *Journal of Finance*.
- International Labor Organisation.** 2012. “Hard to see, harder to count.” <http://un-act.org/wp-content/uploads/2015/06/Harder-to-See-Harder-to-Count.pdf> (accessed August 14, 2018).
- International Labor Organisation.** 2017. “Child labour.” <http://www.ilo.org/global/topics/child-labour/lang--en/index.htm> (accessed August 14, 2018).
- International Labor Organization.** 2012. “ILO 2012 global estimate of forced labour. Executive summary.” http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---declaration/documents/publication/wcms_181953.pdf (accessed August 14, 2018).
- International Labour Office, International Programme on the Elimination of Child Labour.** 2012. “Marking progress against child labour. Global estimates and trends 2000–2012.” 1–48. https://www.ilo.org/ipecc/Informationresources/WCMS_221513/lang--en/index.htm (accessed August 14, 2018).

- International Labour Organization.** 1930. “C029 - forced labour convention.” http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C029 (accessed August 14, 2018).
- International Labour Organization.** 1957. “C105 - abolition of forced labour convention.” http://www.ilo.org/dyn/normlex/en/f?p=1000:12100:0::NO::P12100_ILO_CODE:C105 (accessed August 14, 2018).
- International Labour Organization.** 1973. “C138 - minimum age convention.” http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C138 (accessed August 14, 2018).
- International Labour Organization.** 1999. “C182 - worst forms of child labour convention.” http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_ILO_CODE:C182 (accessed August 14, 2018).
- International Labour Organization.** 2014. “World of work 2014: developing with jobs.” ISBN 978-92-2-129040-7. http://www.ilo.org/global/research/global-reports/world-of-work/2014/WCMS_243961/lang--en/index.htm (accessed August 14, 2018).
- Jansson, Maarten, and Santanu Roy.** 2015. “Competition, disclosure and signalling.” *The Economic Journal*, 125(582): 86–114.
- Konings, Jozef, Patrick Van Cayseele, and Frederic Warzynski.** 2005. “The effects of privatization and competitive pressure on firms’ price-cost margins: micro evidence from emerging economies.” *The Review of Economics and Statistics*, 87(1): 124–134.
- Krishna, Pravin, and Mine Zeynep Senses.** 2014. “International trade and labor income risk in the United States.” *The Review of Economic Studies*, 81(1): 186–218.
- Krugman, Paul.** 1995. “Increasing returns, imperfect competition and the positive theory of international trade.” In *Handbook of International Economics*. Vol. 3, , ed. Gene M. Grossman and Kenneth Rogoff, Chapter 24, 1243–1277. Elsevier.
- Kucera, David, and Ritash Sarna.** 2006. “Trade union rights, democracy, and exports: a gravity model approach.” *Review of International Economics*, 14(5): 859–882.
- Levin, Dan, James Peck, and Lixin Ye.** 2009. “Quality disclosure and competition.” *Journal of Industrial Economics*, LVII(1): 167–196.
- Macis, Mario, and Fabiano Schivardi.** 2016. “Exports and wages: rent sharing, workforce composition, or returns to skills?” *Journal of Labor Economics*, 34(4): 945–978.
- Maloney, Carolyn B., and Chris Smith.** 2015. “Business supply chain transparency on trafficking and slavery act of 2015.” <https://www.govtrack.us/congress/bills/114/hr3226/text> (accessed August 14, 2018).

- Maloney, Carolyn B., Chris Smith, Jackie Speier, and Jim McGovern.** 2011. "The business transparency on trafficking and slavery act." <https://www.govtrack.us/congress/bills/112/hr2759/text> (accessed August 14, 2018).
- Marymount University, Center for Ethical Concerns.** 1999. "The consumer and sweatshops." <https://connect.marymount.edu/news/garmentstudy/overview.html> (accessed August 14, 2018).
- McCaig, Brian, and Nina Pavcnik.** 2014. "Export markets and household business performance: evidence from Vietnam." Paper presented at the Northeast Universities Development Consortium, Boston University.
- McCaig, Brian, and Nina Pavcnik.** 2018. "Export markets and labor allocation in a low-income country." *American Economic Review*, 108(7): 1899–1941.
- Melitz, Marc, and Gianmarco Ottaviano.** 2008. "Market size, trade, and productivity." *The Review of Economic Studies*, 75(3): 985–985.
- Melitz, Marc J.** 2003. "The impact of trade on intra-industry reallocations and aggregate industry productivity." *Econometrica*, 71(6): 1695–1725.
- Menezes-Filho, Naércio Aquino, and Marc-Andreas Muendler.** 2011. "Labor reallocation in response to trade reform." National Bureau of Economic Research 17372.
- Michaels, Guy, and Xiaojia Zhi.** 2010. "Freedom fries." *American Economic Journal: Applied Economics*, 2(3): 256–281.
- Milgrom, Paul R.** 1981. "Good news and bad news: representation theorems and applications." *The Bell Journal of Economics*, 12(2): 380–391.
- Newman, Carol, John Rand, and Finn Tarp.** 2013. "Industry switching in developing countries." *World Bank Economic Review*, 27(2): 357–388.
- New Straits Times.** 2017. "Malaysia allocates RM5m to check on alleged use of child labour in palm oil sector: Mah." <https://www.nst.com.my/news/2017/03/225294/malaysia-allocates-rm5m-check-alleged-use-child-labour-palm-oil-sector-mah> (Accessed August 14 2018).
- New York Times.** 2012. "Christmas ornaments, child labor." <http://www.nytimes.com/2012/12/25/opinion/christmas-ornaments-child-labor.html> (accessed August 14, 2018).
- Nguyen, Chi Huu, and Christophe J. Nordman.** 2017. "Household entrepreneurship and social networks: panel data evidence from Vietnam." *The Journal of Development Studies*, 0(0): 1–25.

- Nickell, Stephen J.** 1996. "Competition and corporate performance." *Journal of Political Economy*, 104(4): 724–746.
- Nuermberger, Ruth Ketring.** 1942. *The free produce movement: a quaker protest against slavery (historical papers of the Trinity College historical society, series xxv)*. Duke University Press.
- Pham Minh Huan.** 2012. "Bureau of International Labor Affairs. Public submissions for child labor and forced labor reporting. Ref: opposition to the inclusion of brick and garment from Viet Nam in DOL's. 2012 lists of goods produced by child labor and forced labor under the "Trafficking victims protection reauthorization act and executive order 13126"." <http://www.dol.gov/ilab/submissions/pdf/20121026.pdf> (accessed August 14, 2018).
- Pierce, Justin R., and Peter K. Schott.** 2016. "The surprisingly swift decline of US manufacturing employment." *American Economic Review*, 106(7): 1632–1662.
- Prasad, Monica, Howard Kimeldorf, Rachel Meyer, and Ian Robinson.** 2004. "Consumers of the world unite: a market-based response to sweatshops." *Labor Studies Journal*, 29(3): 57–80.
- Pruitt, Stephen W., and Monroe Friedman.** 1986. "Determining the effectiveness of consumer boycotts: a stock price analysis of their impact on corporate targets." *Journal of Consumer Policy*, 9(4): 375–387.
- Reardon, Thomas.** 1997. "Using evidence of household income diversification to inform study of the rural nonfarm labor market in Africa." *World Development*, 25(5): 735–747.
- Rodrik, Dani.** 1996. *Labor standards in international trade: do they matter and what do we do about them?* Johns Hopkins University Press.
- Rosenthal, Paul, and Anne. Hawkins.** 2015. "Applying the law of child labor in agricultural supply chains: a realistic approach." *U.C. Davis Journal of International Law and Policy*, 21(2).
- Salem, Samira, and Faina Rozental.** 2012. "Labor standards and trade: a review of recent empirical evidence." *Journal of International Commerce and Economics*, 4: 1–36.
- Scitovszky, Tibor.** 1944. "Some consequences of the habit of judging quality by price." *The Review of Economic Studies*, 12(2): 100–105.
- Selten, Reinhard.** 1975. "A reexamination of the perfectness concept for equilibrium points in extensive games." *International Journal of Game Theory*, 4(1): 25–55.
- Shaked, Avner, and John Sutton.** 1982. "Relaxing price competition through product differentiation." *The Review of Economic Studies*, 49(1): 3–13.
- Social Europe.** 2014. "After Rana Plaza: consumer interviews." <https://www.youtube.com/watch?v=tuNwd1YOVTA> (accessed August 14, 2018).

- Tadelis, Steven.** 1999. "What's in a name? Reputation as a tradeable asset." *American Economic Review*, 100(3): 548–563.
- The Coca-Cola Company.** 2015. "Colombia sugar industry situational analysis." <http://assets.coca-colacompany.com/fd/d8/4c5ed29842cba83b99349b7a58af/colombia-sugar-industry-situational-analysis.pdf> (accessed August 14, 2018).
- The Economist.** 2013. "Why are no-frills airlines so cheap?" <http://www.economist.com/blogs/economist-explains/2013/10/economist-explains-13> (accessed August 14, 2018).
- The Guardian.** 2014a. "Have you changed your buying habits since the Rana Plaza disaster video." <http://www.theguardian.com/world/video/2014/apr/16/rana-plaza-factory-disaster-change-fashion-buying-habits-video> (accessed August 14, 2018).
- The Guardian.** 2014b. "Is child labour a thing of the past?" <https://www.theguardian.com/environment/2014/dec/21/is-child-labour-thing-of-past-lucy-siegle> (accessed August 14, 2018).
- The Royal Thai Embassy.** 2010. "Bureau of International Labor Affairs. Public submissions for child labor and forced labor reporting." <http://www.dol.gov/ilab/submissions/pdf/20100105.pdf> (accessed August 14, 2018).
- The SOLD Project.** 2007. "The Freedom project: prevention through education." <https://thesoldproject.com/our-work.aspx> (accessed August 14, 2018).
- The Telegraph.** 2016. "48 reasons why you don't hear much from Michael O'Leary anymore." <http://www.telegraph.co.uk/travel/lists/Michael-OLearys-most-memorable-quotes/> (accessed August 14, 2018).
- The Walt Disney Company.** 2013. "Permitted sourcing countries." <https://thewaltdisneycompany.com/citizenship/act-responsibly/responsible-supply/ils/permitted-sourcing-countries> (accessed August 14, 2018).
- The World Bank.** 2017. "World integrated trade solution." <http://wits.worldbank.org/> (accessed August 14, 2018).
- Trebbi, George, Thomas Hayes, and Mary Walker.** 1999. "Characteristics of lawyers portrayed in television advertising: the effects of preference, client-role and advertisement type." *Journal of Professional Services Marketing*, 19(1): 73–89.
- United Nations.** 1926. "Slavery convention." <http://www.ohchr.org/EN/ProfessionalInterest/Pages/SlaveryConvention.aspx> (accessed August 14, 2018).

- United States Department of Labor.** 2014. “U.S. Department of Labor’s list of goods produced by child labor or forced labor.” http://www.dol.gov/ilab/reports/pdf/TVPRA_Report2014.pdf (accessed August 14, 2018).
- United States Department of Labor.** 2016. “U.S. Department of Labor’s list of goods produced by child labor or forced labor.” https://www.dol.gov/sites/default/files/documents/ilab/reports/child-labor/findings/TVPRA_Report2016.pdf (accessed August 14, 2018).
- U.S. Department of Labor. Bureau of International Labor Affairs. Office of Child Labor, Forced Labor, and Human Trafficking.** 2015. “Frequently asked questions: list of goods produced by child labor or forced labor.” <https://www.youtube.com/watch?v=tuNwd1Y0VTA> (accessed August 14, 2018).
- U.S. Department of State.** 2010. “Senate bill no. 657.” <http://www.state.gov/documents/organization/164934.pdf> (accessed August 14, 2018).
- US Supreme Court.** 1977. “Bates v. State Bar of Arizona.”
- van der Sluis, Justin, Mirjam van Praag, and Wim Vijverberg.** 2005. “Entrepreneurship selection and performance: a meta-analysis of the impact of education in developing economies.” *The World Bank Economic Review*, 19(2): 225–261.
- Varian, Hal. R.** 1980. “A model of sales.” *American Economic Review*, 70(4): 651–659.
- Vietnam Chamber of Commerce and Industry.** 2012. “Bureau of International Labor Affairs. Public submissions for child labor and forced labor reporting. Ref: opposition to the inclusion of brick and garment from Viet Nam in DOL’s. 2012 lists of goods produced by child labor and forced labor under the “Trafficking victims protection reauthorization act and executive order 13126”.” <http://www.dol.gov/ilab/submissions/pdf/20121120.pdf> (accessed August 14, 2018).
- Wacziarg, Romain, and Jessica Seddon Wallack.** 2004. “Trade liberalization and intersectoral labor movements.” *Journal of International Economics*, 64(2): 411–439.
- Walk Free Foundation.** 2015. “Slavery alert: consumer poll, United States.” <http://d3mj66ag90b5fy.cloudfront.net/wp-content/uploads/2015/03/Consumer-Poll-USA.pdf> (accessed August 14, 2018).
- Wildenbeest, Matthijs.** 2011. “An empirical model of search with vertically differentiated products.” *RAND Journal of Economics*, 42(4): 729–757.
- World Bank.** 2018. “World development indicators.” <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 14, 2018).
- World Food Programme.** 2003. “Food for education in Bangladesh.” <https://www.wfp.org/content/food-education-bangladesh> (accessed August 14, 2018).