Essays in Applied Microeconomics

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Table of contents

List of Figures

List of Tables

SUMMARY

The unifying theme of my dissertation is the study of unintended consequences of policies designed to increase human capital. The first policy relates to health: restrictions on tobacco advertising, aimed at reducing cigarette consumption. The second policy relates to education: conditional cash transfers to girls enrolled in secondary school, aimed at increasing educational outcomes and bridging gender gap in education.

In the first chapter, entitled "Advertising restrictions and market concentration in the cigarette industry: a cross-country analysis", I study the effect of advertising restrictions on market concentration. I use variation in the timing of adoption of restriction across countries and estimate difference-in-difference models to obtain the effect on market-concentration, as measured by Herfindahl-Hirschman Index (HHI). The findings in this chapter provide evidence of a positive relationship between advertising restrictions and market-concentration, which represents an importance trade-off for policy makers: on one hand, advertising restrictions are likely to smoking, and on the other hand, by leading to an increase in market-concentration, they may be giving more power to tobacco companies. This trade-off is crucial especially for developing countries, where prevalence is rising and adoption of advertising restrictions is an important means of early intervention.

In the second chapter of my dissertation, entitled "Indirect Effect of Conditional Cash Transfers: Evidence from Pakistan", I study an education program introduced in the Punjab province of Pakistan, formally known as, Female School Stipend Program (FSSP). The program offers monthly stipends to girls enrolled in secondary public school with an eight percent attendance rate. I analyze the impact of having an eligible older sister on educational outcomes of younger siblings, separately for brothers and sisters. The study is motivated by the work of Ferreira, Filmer and Shady (1999) who argue that there may be negative impact on the outcomes of ineligible children in the context where parents place different values on education for different children. The program is well suited to test the predictions of this model, as there is clear evidence of discrimination in Pakistan. Using a difference-in-difference approach, I find that conditional cash transfers are successful in increasing enrollment of girls of eligible cohorts but have no impact on the enrollment of younger ineligible cohorts of boys and girls.

1 ADVERTISING RESTRICTIONS AND MARKET CONCENTRATION IN THE CIGARETTE INDUSTRY: A CROSS-COUNTRY ANALYSIS

1.1 Introduction

Tobacco use represents the largest preventable cause of premature death and disease in the world. It contributes to over six million deaths per year, which is expected to rise to between eight and ten million by 2030. It is well documented that advertising increases tobacco use; it encourages youth to experiment with tobacco products, reduces current users' motivation to quit, and encourages former users to resume tobacco use (Kasza, 2011). This link between advertising and smoking is a key concern for policy makers, and has led to an extraordinary rise in advertising restrictions across the world. While overall evidence is mixed, prominent studies indicate that advertising restrictions have contributed to a fall in cigarette consumption in high-income countries (Saffer and Chaloupka, 2000) and developing countries (Blecher, 2008). However, recent theoretical work questions whether this association is causal.

In this chapter, I explore the missing link in the studies of advertising restrictions and cigarette consumption. I examine the relationship between tobacco advertising restrictions and market-concentration in the cigarette industry using a cross-country design: a panel dataset for sixty-five countries covering advertising restrictions for seven direct media channels, over fourteen years, from 2001 to 2014[1]. I use variation across countries in the timing of adoption of advertising restrictions to estimate causal effects. Formally, I use difference-in-difference method to estimate market-concentration, as measured by Herfindahl-Hirschman Index (HHI), in countries that adopted a ban between the years 2001 and 2014 and countries that did not. In the final section, I employ the same identification strategy to examine the effect of advertising restrictions on consumption.

Advertising has two equilibrium effects on cigarette demand, the *direct* effect: it promotes smoking, and the *indirect* effect: it influences the degree of concentration in the market (Tremblay

[1]As classified by *WHO Report on Global Tobacco Epidemic, 2013*: Direct form of advertising media includes tv, press, outdoors, point-of-sale, and internet. Indirect advertising includes sponsorships of sporting and entertainment events, and festivals.

and Tremblay, 1999). Any study on the effect of advertising restrictions must take the effect on concentration into account. Previous papers that have examined indirect effects of advertising restrictions have focused on the 1971 Broadcast Advertising ban introduced in United States. Eckard (1991) provides descriptive evidence that firm concentration was more stable or increasing after the ban. Farr, Tremblay and Tremblay (2001) look at price and conclude that there was a fall in market power after the removal of the ban. In contrast to these papers, Bihari and Seldon (2006) find a negative effect of advertising ban on market power using Bresnahan and Lerner indices. Together, these papers produce mixed results.

The central question is: what is the mechanism through which advertising restrictions may affect market-concentration? I present a theoretical argument based on the premise that changes in market-concentration are driven by changes in a firm's reputation. Advertising represents an investment that builds up a firm's stock of goodwill among consumers. It carries over into future periods but loses its value with the passage of time. A ban on advertising increases the cost of firms to reach their consumers, thereby restricting their ability to build goodwill. Firms' market-shares, then, rely on their past goodwill. In asymmetric market structures typical of the cigarette industry, advertising restrictions disproportionately affect smaller firms (who are at low levels of goodwill to begin with), leading to an increase in market-concentration.

An important consideration for empirical analysis in the present study is that narratives of tobacco policy change, advanced in public policy literature, identify a contrast between developed and developing countries. In the former, policy changes can be described as "an incremental progression of, rather than a radical departure from, policies already in place," driven by domestic institutions, efforts of public health groups, higher scientific knowledge, and changing social attitudes. In the latter, policy change has followed the recent global tobacco control agenda led by international organizations, such as the World Bank, WHO, United Nations (UN) and NGOs, consequently leading to the development of World Health Organization Framework Convention on Tobacco Control (WHO FCTC) (Cairney, Studler and Mamudi, 2011).

The suggestion here is that developed and developing countries follow different trajectories to policy changes. Perhaps a stronger argument against endogneity can be made in developing countries, where it is the external pressure from international organizations, changing global health agenda, and the contribution of FCTC, that has led to policy changes rather than efforts

internal to the country's environment. In this light, I also show results separately for developed and developing countries.

Consistent with the argument summarized above, I find that advertising ban led to an increase in market-concentration: HHI increased by 0.058 points for countries that adopted the ban between 2001 and 2014, conditional on trade and socio-economic characteristics. This estimate represents approximately 12.8 percent increase with respect to the sample mean (0.45). More importantly, the effect is higher for developing countries (0.081 points), while developed countries see no effect of an advertising ban. A central concern for these estimates is that advertising restrictions may not be independent events. I explore the dynamics of the ban to test whether, in the absence of adoption of ban, HHI would have trended similarly in countries adopting bans at different times. The pattern of coefficients prior to the ban in developing countries provides strong evidence that adoption of the ban led to HHI increase rather than vice-versa. However, the pattern of coefficients in developed countries does not show support for an effect of ban.

These results point to a strong positive relationship between advertising restrictions and market-concentration in developing countries, but no effect in developed countries. I argue that the absence of an effect in developed countries is not surprising. As noted, advertising restrictions in this region are largely the result of domestic efforts by public health groups and other institutions. A discussion of the pace of restrictions, in section 4, also shows that most developed countries had adopted a ban prior to the period under study. The longstanding tobacco control policies and receptive socio-economic context, then, will lead to inconsequential effect of further tobacco control.

A key theme in recent studies of advertising restrictions and cigarette consumption is comparison of varying strengths of policies, based on the idea that if a limited number of media are banned, firms can substitute their efforts to reach consumers toward unrestricted media of advertising (Saffer and Chaloupka, 2000). However, past papers analyzing the effect of these restrictions on market-concentration have only studied the effect of a broadcast ban. I investigate the effects separately for 'limited' and 'comprehensive' restrictions and find important heterogeneity in the effects, that is, limited advertising restrictions have little or no effect on market-concentration in developing countries. Yet again, I find no support for an effect in

developed countries.

Finally, I estimate a simple cigarette demand model to evaluate the effect of advertising restrictions on cigarette consumption after taking the indirect effect into account. Consistent with existing literature, I find that consumption falls after the introduction of advertising bans in developing countries. However, this effect is imprecisely estimated and lower in magnitude.

The results in this paper have important implications for policy. A large body of literature investigates the effect of advertising restrictions on cigarette consumption. These studies, however, are incomplete without consideration of the indirect effect of restrictions through the degree of concentration in the market. My findings extend the literature on indirect effects by providing the first cross-country evidence on the effect of advertising restrictions on market-concentration. In addition, I incorporate seven direct media channels to make comparisons between varying policy strength. I find that an advertising ban leads to an increase in market-concentration in the cigarette-industry. As concentration rises, prices are likely to rise, potentially leading to a fall in cigarette consumption. This presents an important trade-off for policy makers: efforts to reduce smoking seem to have an unintended effect of increasing market-concentration—giving more power to tobacco companies, which are some of the most powerful and wealthiest companies in existence. A crucial finding is that the effect is higher in developing countries: an advertising ban led to a 0.081 point increase in HHI in this region, which represents an 18 percent increase with respect to the sample mean. This is particularly important because a vast literature has linked presence of tobacco companies to increase in smoking in developing countries, where prevalence is rising dramatically: out of the ten million tobacco-related deaths predicted per year by 2030, eighty percent will be in this region.

1.2 Advertising and Cigarette Smoking

A large body of literature investigates the impact of advertising restrictions on cigarette consumption. In general, the effect of these restrictions is found to be negative and larger in developing countries than in developed countries [see Blecher (2008) for a detailed review of literature]. However, the main complication in this literature is that most studies only examine the direct effects of restrictions on cigarette demand. Tremblay and Tremblay (1999) propose a model for cigarette demand whereby advertising has two equilibrium effects. First, the *direct*

effect: it attracts new customers and promotes demand. Second, the *indirect effect*: it influences the degree of concentration in the market. Even in the absence of direct effects of advertising, the indirect effects—through degree of concentration—can lead to a change in consumption. Any study on the effect of advertising restrictions must take the effect on concentration into account. In this section, I present their model to illustrate this argument.

Assume that cigarette demand takes the following form:

$$Q = Q(p(\lambda A), A) \tag{1}$$

where Q denotes cigarette quantity demanded, p denotes price, A denotes advertising, and λ captures the degree of concentration in the market. Then, the total effect of advertising on demand is:

$$\frac{dQ}{dA} = \frac{\partial Q}{\partial p}\frac{\partial p}{\partial \lambda}\frac{\partial \lambda}{\partial A} + \frac{\partial Q}{\partial A} \tag{2}$$

The law of demand indicates that $\frac{\partial Q}{\partial p} < 0$, that is, as price rises, quantity demanded falls. Similarly, by definition, $\frac{\partial p}{\partial \lambda} > 0$, higher concentration allows firms more market power which leads to a rise in price. Recent prominent papers have indicated that $\frac{\partial Q}{\partial A} > 0$, that is, the direct effect of advertising on consumption is positive: more advertising raises consumption whereas advertising restrictions have led to a fall in consumption, especially in developing countries. Finally, $\frac{\partial \lambda}{\partial A}$ denotes that indirect effect of advertising on consumption: the effect of advertising on market-concentration. This is the missing link in previous studies and the primary focus of present analysis. A detailed discussion on the direction of this effect —as advertising is restricted—follows in the next section.

1.3 Advertising Restrictions and Concentration

This section summarizes the theoretical arguments in economics concerning the effect of advertising restrictions on market-concentration. I present this in three steps. First, I outline the

traditional models of advertising and market-concentration, and empirical evidence provided by literature. Second, I describe key features of the cigarette industry relevant to the discussion of an effect of advertising on the market. Third, I introduce a simple theoretical framework to study the impact of advertising restrictions on market-concentration.

A. Early Literature on Advertising and Concentration

The general consensus in earlier literature is that advertising affects market concentration through two mechanisms: consumer demand and barriers to entry. The outcome of each mechanism, in turn, depends on the nature of advertising. Two dominant views exist regarding the nature of advertising (Bagwell, 2007). The first view is that advertising is persuasive (Dixit and Norman, 1977). Firms advertise to differentiate their product and alter consumers' tastes. The goal is to build brand-loyalty and firm reputation. In most cases, advertising has no 'real' value to consumers but creates a false sense of product differentiation. As a result, the firm's demand becomes inelastic and leads to a rise in prices. A consequence of this is that advertising creates barriers to entry, especially when combined with economies of scale in production. A related view is that advertising is part of consumers' preferences; that advertising serves as a complement to the advertised good—more-advertised good is preferred to a less-advertised good (Becker, 1977; Becker and Murphy, 1993). The common idea here is that advertising affects utility derived from consuming a product—it increases their willingness to pay.

The second dominant view is that advertising is informative (Stigler, 1961). This view holds that there are inherent imperfections concerning consumer information in the market. Firms advertise to lower search costs for consumers and provide information regarding the product's price and quality. As a result, the firm's demand becomes more elastic. Additionally, informative advertising allows new firms to inform and publicize their entrance and create demand for their product—lowering barriers to entry. Informational advertising is thus more widespread for differentiated products.

The question of interest is how a restriction on advertising will affect the market. The most apparent consequence of a ban on persuasive advertising is that it will lower brand-loyalty for a firm's product. In the absence of brand-loyalty and product differentiation efforts, the market

may experience a loss in concentration. Thus, a restriction on such advertising has pro-competitive effects. Alternatively, a restriction on informative advertising increases search costs for consumers and creates barriers to entry for new products. High search costs for acquiring price and quality information regarding alternatives may discourage consumers from seeking substitute products. Thus, a restriction on informative advertising has anti-competitive effects.

Early evidence on the effect of advertising restrictions on cigarette-industry concentration, though relatively thin, is mixed, and focused on the United States. Studying the effect of 1971 Broadcast Advertising ban, Eckard (1991) provides descriptive evidence that brand as well as firm market shares were more stable after the ban. Additionally, both brand and firm concentration, which were falling prior to the ban, were more stable or increasing after the ban. His findings are consistent with the pro-competitive theory of advertising. Farr, Tremblay and Tremblay (2001) study the effect of removing the ban on price and find that there is a fall in market power. Their findings reinforce Eckard (1991)'s results and pro-competitive effects of advertising. In contrast to these findings, Bihari and Seldon (2006) find that an advertising ban decreases market power as measured by the Bresnahan and Lerner indices.

These earlier studies conclude that if restrictions on advertising lead to an increase in concentration, then advertising must have been informative. However, this conclusion does not reconcile with accounts on the nature of advertising in the cigarette industry. While there have been few accounts of informational advertising by tobacco firms (for example, advertising by state monopolies), cigarette advertising is largely accepted to be persuasive (Telser, 1962; Goel and Nelsen, 2006). Secondly, theories summarized above fail to take into consideration certain characteristics intrinsic to the cigarette industry.

B. Features of the Cigarette Industry

Historically, there was diversity in market structures across countries: many markets were controlled by a domestic, government run monopoly; others consisted of smaller firms aggressively competing amogst themselves; and some were oligopolistic, with a few firms dominating the market. Over the past two decades, however, owing to the trend toward privatization of state-owned monopolies, trade and investment liberalization, as well as mergers and acquisitions,

markets for cigarettes have become more concentrated—oligopolistic—with a few transnational companies dominating the market in most countries. Another notable feature is that advertising is the major mode of competition among tobacco firms, as noted by Telser (1962), 'The cigarette industry has become the traditional example of an industry in which advertising becomes the main competitive weapon by which oligopolies seek to increase their relative shares.' A third feature of the industry is the addictive nature of cigarettes. Consumers are more likely to switch between different brands than to quit.

C. Theoretical Framework: Effect of Advertising restrictions on market concentration

Next, I introduce a simple theoretical framework to determine the relationship between advertising restrictions and concentration, taking into account the features outlined above. The basic premise here is that changes in market concentration are driven by changes in a firm's reputation.

Drawing on the works of Doraszelski and Markovich (2007), I characterize advertising as an investment that builds up a firm's reputation or stock of goodwill among consumers. As in the case of persuasive and complementary views of advertising, the goodwill stock affects the utility of consumers, increasing their willingness to pay. It carries two properties. First, this stock of goodwill carries over into future periods; in this way, it is related to current as well as past advertising. Second, it depreciates over time; past advertising loses its efficacy with the passage of time.

Assuming that firms only engage in advertising competition and the total size of the market remains the same, in each period, a firm decides how much to advertise in order to add to its goodwill. At the same time, past advertising becomes less effective. Profits are determined by the level of goodwill. Advertising investment chosen by a firm, then, will depend on the benefits of advertising: increase in profits generated by higher goodwill; and, costs of advertising: advertising expenses and depreciation rate of past advertising.

I present two propositions. The first is that *cost and benefit considerations create strategic advantage for a firm; asymmetries in market shares arise and persist if one or a few firms have a strategic advantage over the other firms.* Marginal benefit of advertising is derived from the

increase in profits generated by goodwill of the firm. It increases in a firm's goodwill; and as the total market size does not change, it decreases in competitor's goodwill. Marginal cost depends on the cost of advertising and depreciation rate of past advertising. In an oligopolistic market, characteristic of the cigarette industry, where large firms are able to engage in high spending on advertising, smaller firms have a weak incentive to advertise. A strong competitor makes it harder for a small firm to acquire or extract much of their increased willingness to pay from the consumers. In this way, an increase in the stock of goodwill is worth less to a firm when competing against large firms than with smaller, more equal firms. On the other hand, since marginal benefit increases as a firm's good will increases, it gives larger firms a strategic advantage over the smaller firms, as they are much more able to utilize the increased willingness to pay.

The second proposition is that *when advertising is expensive, on average, increase in the cost of advertising will lead to relative advantage for larger firms.* Large tobacco firms have a strategic advantage over small firms. An increase in costs effectively means that the marginal benefit of advertising is small relative to its cost. Thus, marginal benefit is even smaller for small firms and lowers their incentive to advertise when competing against large firms. This decreases their reputation/goodwill stock and consequently market-share.

The above framework suggests that beginning with a situation where some large firms dominate the market, increases in advertising restrictions, which make advertising more expensive, will make smaller firms relatively worse off. Restrictions reduce the efficacy of advertising; they reduce the ability of a firm to build up its goodwill; they make it costlier for firms to reach consumers. Given that these cost/benefit considerations lead to larger firms dominating the industry, restricting advertising will lead to a higher level of concentration. The increase in costs—fall in marginal benefit for small firms—may be so high that it intensifies exit of smaller firms from the market.

In addition, the framework allows me to differentiate between short-run and long-run effects of advertising restrictions. There are several reasons why that may occur. Though advertising restrictions affect the ability of firms to build their goodwill, the existing stock from past advertising will take time to depreciate. The time it will take to depreciate, however, is not known a priori. Previous studies do not provide much guidance on the estimate either. However, it is clear that the short-run effect of the restrictions will be smaller than long-run effect. Another

reason the impact may differ is the entry and exit activity. While redistribution of market-shares can occur quickly, the number of firms operating in the market will take time to adjust.

Finally, the impact of the restrictions on market concentration may also depend on the strength of restrictions. Saffer and Chaloupka (2000) contend that because firms can substitute banned channels of advertising for other unbanned channels, comprehensive advertising bans will reduce cigarette consumption, whereas a limited advertising will have little or no effect. They show empirical evidence from 22 high-income countries to that effect. Blecher (2008) follows similar argument and shows that comprehensive advertising have a strong effect on consumption in developing countries, and limited advertising has little or no effect. The same reasoning can be applied to the effect on market-concentration.

There are two papers that draw on similar starting points as in the present framework to evaluate the effect of advertising restrictions (1971 Broadcast advertising ban) on market concentration (in the United States). Tan (2006) studies short- and long-run effects of advertising restriction on market structure through simulations. He finds that in the short-run restrictions lead to slightly high price, while in the long-run, strict restrictions increase market concentration. Qi (2013) studies the puzzling fact that after the ban, advertising spending fell for five years and then rose above pre-ban levels. She concludes that the market became more concentrated as a result of the ban; and in order to maintain their competitive edge, large brands were likely to increase their advertising spending, which contributed to the overall rise.

1.4 Data and Descriptive Statistics

A. Data Sources

The main resource for advertising restrictions adopted at country level is the World Health Organizations Tobacco Restriction Policy Data, known as MPOWER. MPOWER contains information on six tobacco control measures identified by WHO FCTC as best practices: Monitor tobacco use and prevention policies, Protect people from tobacco smoke, Offer help to quit tobacco use, Warn people about the dangers of tobacco, Enforce bans on tobacco advertising, Promotion and sponsorship, and Raise taxes on tobacco. Relevant to this study, the dataset provides information on restrictions for the following media: National TV and Radio, International TV

and Radio, Local Magazines and Newspapers, International Magazines and Newspapers, Bill Board and Outdoor Advertising, Point of Sale, and Internet, for years 2008, 2010, 2012 and 2014.

Using MPOWER as a benchmark, I supplemented these data by drawing on various other resources. These include: World Health Organization Regional Office for Europe, ERC Group Research Reports, Tobacco Control Laws.org, press releases and previous literature. My final sample for advertising restrictions contains 65 countries and 7 media over 14 years, from 2001 to 2014.

Data on market-shares come from Euromonitor Passport Global Market Information Database 2011, 2014, and 2015 editions. Market-share for a firm is calculated as the volume share of sticks sold annually by each firm at national level. Along with changes in retail sales due to demand, changes in market-shares capture merger and acquisition activity as well as brand acquisitions or disposals.

Additionally, I draw upon Euromonitor Passport Database to create controls for summary statistics of the trade environment in each country-year, including cigarette production, imports, and exports. Foreign direct investment (inward flow) is included from United Nations Conference on Trade and Development (UNCTAD) as a percentage of gross domestic product. I use World Bank World Development Indicators Database to create demographic controls such as gross domestic product per capita, population, and unemployment. Finally, to control for other market conditions, I source smoking prevalence and taxation[2] from Euromonitor Passport, and prices from Economist Intelligence Unit (EIU). EIU provides four prices for cigarettes: price of a local brand from a low-level market and super-market, and price from Marlboro (or equivalent brand) from the two venues. I use average Marlboro (or equivalent brand) price per pack in each country and year.

My final dataset contains 65 countries and 7 media over 14 years, from 2001 to 2014. Details of the dataset are discussed below.

B. Advertising restrictions: Policy change and Uniformity

Most countries in the sample introduced their first advertising restriction prior to start of the

[2]Tax is measured as ad valorem tax plus specific tax as a percentage of Marlboro price.

study period, that is, year 2001. The total number of countries having some advertising restriction increased from forty in 2001 to sixty-one in 2014. Forty-eight either made incremental changes to their policy or introduced first restriction during this time. More countries are increasingly moving toward broadly inclusive advertising restrictions. By the end of the period, four countries have yet to introduce any restriction on tobacco advertising: Guatemala, Indonesia, Japan, and Nigeria.

I am able to study policy changes and trends in my sample in two ways, by measuring the strength of a country's tobacco policy, or number of media bans introduced; and by measuring the pace, or speed at which the bans were introduced. As mentioned in the introduction, the adoption of tobacco advertising restrictions varies markedly over time and across countries. I can also make useful comparisons regarding strength and pace between developed and developing countries.

Table 1 identifies strength and pace of advertising restrictions over the fourteen years under study, from 2001 to 2014. Strength of the policy is assessed through how many different types of media are banned from tobacco advertising in a country. This is measured by an index, with a value of 1.00 meaning that a country has banned all seven indicated media. Pace is assessed through an analysis of how quickly a country introduces the bans on various media. This is measured by looking at the range of years, from the first ban through the last policy change. The table is organized to answer the following question: *which country, in each group, was the fastest to introduce the strongest advertising restrictions?*

Developed and developing countries follow different trajectories in terms of tobacco control policies in general. The same applies to advertising restrictions. Developed, high-income countries tend to have stronger policy restrictions introduced at slow pace. That is, they began early and moved their tobacco control efforts across a wide range of media, over an extended period of time. Singapore, Poland, Sweden, Finland, Belgium, Italy, Norway and New Zealand have comprehensive set of advertising restrictions prior to 2001, while others countries such as, Germany, UK, Greece and Australia have made incremental changes during period of study. Switzerland, Israel and UK are among the least restrictive countries by 2014. Japan is the only developed country with no advertising restriction on tobacco.

Developing, middle- to low-income countries tend to start their efforts later and have low strength, that is, fewer media restrictions. To the extent that lower income countries have been

widening the scope of advertising restrictions, it has been in recent years, even among those that had early starts such as Brazil and Ukraine. Some countries have spurts concentrated in a few years: Costa Rica, Colombia, Ecuador, Philippines and Kenya, while others have made slow consistent efforts through the decade to increase their strength. Peru and Pakistan are trailing, with the slowest start and lowest strength. While Guatemala, Indonesia and Nigeria have no advertising restrictions on tobacco.

As noted, there has been a move towards uniformity in tobacco advertising policies across the world: by 2014 most countries have adopted the majority of advertising restrictions regarded by WHO FCTC as best practices. Figure 1 presents a picture of the extent of this uniformity. A policy is classed as comprehensive if five or more media are banned (Saffer and Chaloupka, 2000). Panel A plots the percent of countries in the sample that have adopted comprehensive advertising restrictions in the sample from 2001 to 2014. Panel B plots developed and developing countries separately. Overall, the basic trend is toward further tobacco control. The total number of countries having a comprehensive set of advertising restrictions increased from 15 in 2001 (23%) to 49 in 2014 (75%). The number is significantly higher in 2014 in both groups, suggesting that advertising control policies have become more restrictive over time.

TABLE I. PACE OF ADOPTION AND STRENGTH OF ADVERTISING RESTRICTIONS BY COUNTRY, 2001-2014

Country	Pace	Strength	
	First Restriction to Last Change	*Index*	*Comprehensive in 2014?*
Panel A: Developed Countries (n=34)			
Singapore	Pre-2001	1.00	✓
Poland	Pre-2001	1.00	✓
Sweden	Pre-2001	0.86	✓
Finland	Pre-2001	0.86	✓
Belgium	Pre-2001	0.86	✓
Italy	Pre-2001	0.86	✓
Norway	Pre-2001	0.71	✓
New Zealand	Pre-2001	0.71	✓
Hungary	Pre-2001 to 2006	0.71	✓
Saudi Arabia	Pre-2001 to 2007	0.86	✓
Germany	Pre-2001 to 2007	0.71	✓
Portugal	Pre-2001 to 2007	0.71	✓
Austria	Pre-2001 to 2008	0.86	✓
Croatia	Pre-2001 to 2009	1.00	✓
United Kingdom	Pre-2001 to 2010	0.71	✓
Greece	Pre-2001 to 2010	0.71	✓
Czech Republic	Pre-2001 to 2010	0.71	✓
Australia	Pre-2001 to 2012	0.86	✓
France	Pre-2001 to 2012	0.71	✓
UAE	Pre-2001 to 2013	1.00	✓
Slovakia	2001 to 2005	0.86	✓
Denmark	2001 to 2014	0.86	✓
Ireland	2002 to 2004	0.71	✓
Russia	2005 to 2013	1.00	✓
Spain	2006	0.86	✓
Chile	2006 to 2013	1.00	✓
Uruguay	2008	0.86	✓
Argentina	2011 to 2014	0.86	✓
Netherlands	Pre-2001 to 2005	0.57	×
Canada	Pre-2001 to 2010	0.57	×
Switzerland	Pre-2001	0.29	×
Israel	Pre-2001 to 2008	0.29	×
USA	Pre-2001	0.14	×
Japan			×

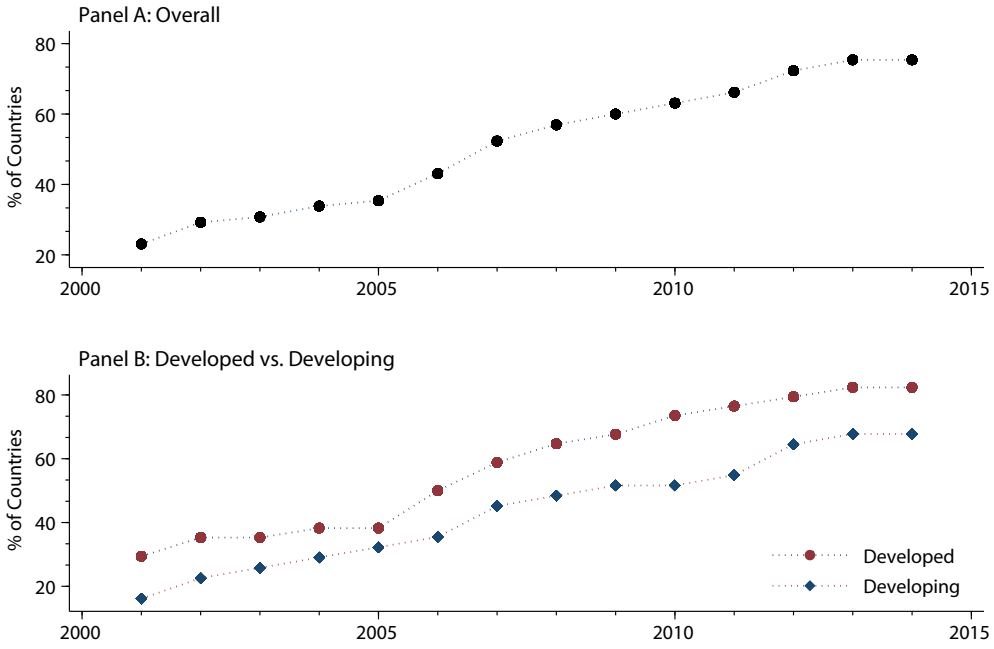
Sources: World Health Organization (WHO)'s Tobacco Restriction Policy Data (MPOWER), WHO Regional Office for Europe, ERC Group Research Reports, Tobacco Control Laws.org, press releases and previous literature.

TABLE I. PACE OF ADOPTION AND STRENGTH OF ADVERTISING RESTRICTIONS BY COUNTRY, 2001-2014 *(contd)*

Country	Pace	Strength	
	First Restriction to Last Change	*Index*	*Comprehensive in 2014?*
Panel B: Developing Countries (n=31)			
Iran	Pre-2001	1.00	✓
Thailand	Pre-2001	0.71	✓
Algeria	Pre-2001	0.71	✓
Egypt	Pre-2001 to 2002	1.00	✓
India	Pre-2001 to 2005	1.00	✓
Romania	Pre-2001 to 2006	0.71	✓
Tunisia	Pre-2001 to 2007	0.71	✓
Turkey	Pre-2001 to 2008	1.00	✓
Brazil	Pre-2001 to 2012	1.00	✓
Vietnam	Pre-2001 to 2012	1.00	✓
Ukraine	Pre-2001 to 2012	0.86	✓
Azerbaijan	2001 to 2007	1.00	✓
Serbia	2002 to 2005	0.86	✓
Malaysia	2004	1.00	✓
Kazakhstan	2004 to 2007	1.00	✓
Philippines	2007 to 2008	0.86	✓
Kenya	2007	1.00	✓
Colombia	2009	1.00	✓
Ecuador	2011	0.86	✓
Costa Rica	2012	1.00	✓
Pakistan	2013	0.71	✓
China	Pre-2001	0.57	×
Bulgaria	Pre-2001 to 2006	0.57	×
South Africa	2001 to 2008	0.57	×
Uzbekistan	2011	0.57	×
Morocco	Pre-2001	0.43	×
Mexico	Pre-2001 to 2008	0.43	×
Peru	2006	0.43	×
Indonesia			×
Guatemala			×
Nigeria			×

Sources: World Health Organization (WHO)'s Tobacco Restriction Policy Data (MPOWER), WHO Regional Office for Europe, ERC Group Research Reports, Tobacco Control Laws.org, press releases and previous literature.

Figure 1. Percent of countries with *'comprehensive'* advertising restrictions.



Notes: Based on Saffer and Chaloupka(2000), restrictions are classified as 'comprehensive' if 5 or more advertising media are banned. High-income countries (>(\$12,745) are classified as developed; middle- (\$1,046 - \$12,745) and low-income countries (≤\$1045) are classified as developing countries.
Sources: World Health Organization (WHO)'s Tobacco Restriction Policy Data (MPOWER), WHO Regional Office for Europe, ERC Group Research Reports, Tobacco Control Laws.org, press releases and previous literature.

Table 1 and Figure 1 present three main findings. First, there are clear leaders in advertising restrictions. They belong to the developed, high-income region. Second, even though there is now considerable uniformity in policies from country to country, developing countries with comprehensive restrictions are still fewer as a group, and have had a slower start in adoption. Third, the pace of adoption differs between the two regions. Developed countries have made small additions to their policies over an extended period of time, while growth of restrictions in developing restrictions is concentrated in recent years.

C. Market Concentration

I define market-concentration as the measure of the extent to which a small number of firms account for a large proportion of an industry's output. As suggested by Hannah and Kay (1977), the measure must satisfy a number of generally desirable conditions:

1. An increase in the cumulative share of the ith firm, for all i ranking firms 1,2,N in descending order of size, implies an increase in concentration.
2. Switching from smaller to larger firms should increase concentration. (Sales Transfer Principle)
3. Entry of new firms, below the average size of existing firms, should reduce concentration (assuming the relative market shares of existing firms remains unchanged).
4. Mergers should increase concentration.
5. If the share of a firm becomes progressively smaller, so should its effect on concentration measure.

There are several measures of concentration advanced in literature. Of these, some are termed as absolute measures: they combine the number of firms and their share distribution. The interpretation here is that the higher the measure is, the less competitive the market is. Others are termed as relative measures: they focus on inequalities in shares of firms operating in the market. The interpretation is that the more unequal the shares are, the less competitive the market is.

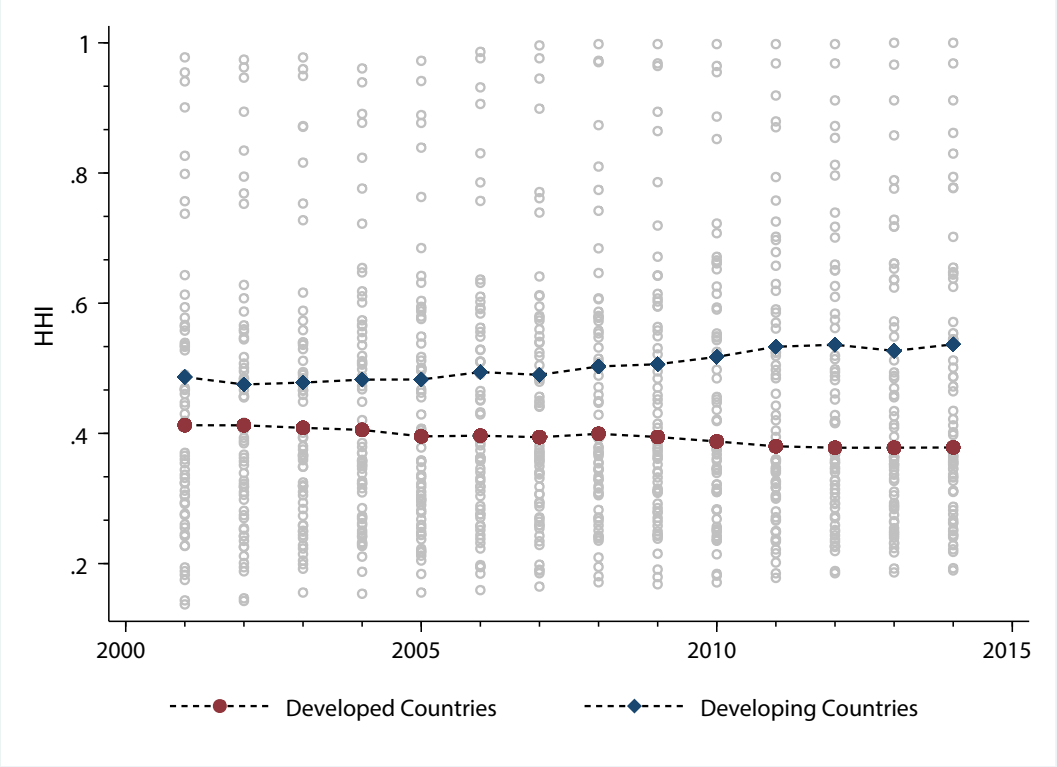
Relative measures of concentration do not conform to the concept of concentration as defined here. The main reason is that they don't take number of firms into account. A relative measure may indicate that 10 percent of firms hold 95 percent of output—this 10 percent may comprise one firm or hundred firms. An extreme case is a market with only one firm—absolute measure will reach its maximum value while relative measure will reach the minimum. In a less extreme case, relative measures fail to allow for the number of equal-sized firms. According to neoclassical theory, higher number of firms and more uniform share size suggests greater degree of competition. The examples above show that absolute measures of concentration are a better reflection of competitive pattern of behavior and, thus, are more relevant to my analysis.

The most popular absolute measures of concentration are the Concentration Ratio (CR_k) and Herfindahl-Hirschman Index (HHI). CR_k is defined as the cumulative market share, from largest to smallest, of kth firm, and HHI is defined as the sum of squared-market-shares of all firms. There is a debate over the most accurate value of k to calculate concentration ratios. Regardless of the number, CR has two major drawbacks. First, it provides no information about relative size variation across the largest k firms—the same ratio may describe a market with equal-sized firms or a monopoly with only firm. Second, it provides no information about the distribution of shares outside of largest k firms—the same ratio may describe two markets with identical shares held by the largest k firms, even though one may have more firms in total and may be more competitive.

HHI conforms more closely to the desirable conditions set above. Specifically, it decreases with the number of firms in the market, and increases with variance in market-shares. Moreover, it gives more weight to larger firms. One drawback of HHI, however, is that it requires data for all firms operating in the market. In the analysis that follows, I use HHI as the dependent variable.

Figure 2 plots HHI for the cigarette industry from 2001 to 2014, calculated using market-share information obtained from Euromonitor Passport. I make a distinction between developed and developing countries. Overall, there is relatively little change in HHI overtime in developed countries; though there is a slight trend toward less concentration. Mean HHI for this region is 0.39. Developing countries, as a whole, are more concentrated, and continue the trend, especially after 2005. Mean HHI for this region is 0.51.

Figure 2. Market-concentration, HHI, in the cigarette industry for developed and developing countries, 2001-2014.



Notes: High income countries (>(\$12,745) are classified as developed; middle- (\$1,046 - \$12,745) and low-income countries (≤\$1045) are classified as developing countries. Overall mean HHI is 0.39 for developed countries and 0.51 for developing countries.
Sources: Euromonitor Passport Database, editions 2011, 2014 and 2015.

D. How are advertising bans and market-concentration related?

Next, I present a series of graphs illustrating the relationship between adoption of advertising bans and market-concentration, to build on the theoretical argument presented previously (in section 3) and provide intuition for the empirical strategy described ahead (in section 5).

Figure 3 shows number of developed countries that have adopted a ban on at least 1 medium, alongside plots of HHI in countries that had at least 1 ban prior to 2001, and HHI in countries that adopted at least 1 ban during 2001-2014. In terms of changes in advertising restrictions, the graph restates findings discussed in table I: most developed countries had a ban prior to 2001. Among the countries that adopted a ban during the period under study, the changes occurred during early years. In terms of concentration in the cigarette industry, the former group follows a similar pattern as shown in figure 2: there is a slight trend toward more competitive markets. In the latter group, there is a sharp fall in HHI till 2005, after which it stabilizes, with a slight rise toward the end of the period. Loosely, the graph shows that as countries adopted advertising bans, there was a negative movement in HHI overtime.

Figure 4 mimics the format of figure 3 for developing countries. Patterns in this graph are strikingly different from the patterns shown for developed region. Few countries had any ban prior to 2001. There is a consistent rise in countries adopting a ban throughout the period. In terms of concentration, in the former group HHI is relatively stable over time. However, in the latter group, that is, countries that adopted a ban between 2001 and 2014, there is a rise in concentration overtime, revealing a noticeably similar movement between concentration and number of countries adopting bans. Figure 3 and 4 suggest a strong relationship between adoption of bans and market concentration, albeit in opposite directions, for developed and developing countries. Of course, this relationship cannot be interpreted as causal. I explore this in more detail by focusing on HHI in countries that introduced first advertising restriction after 2001, pre- and post- adoption of ban.

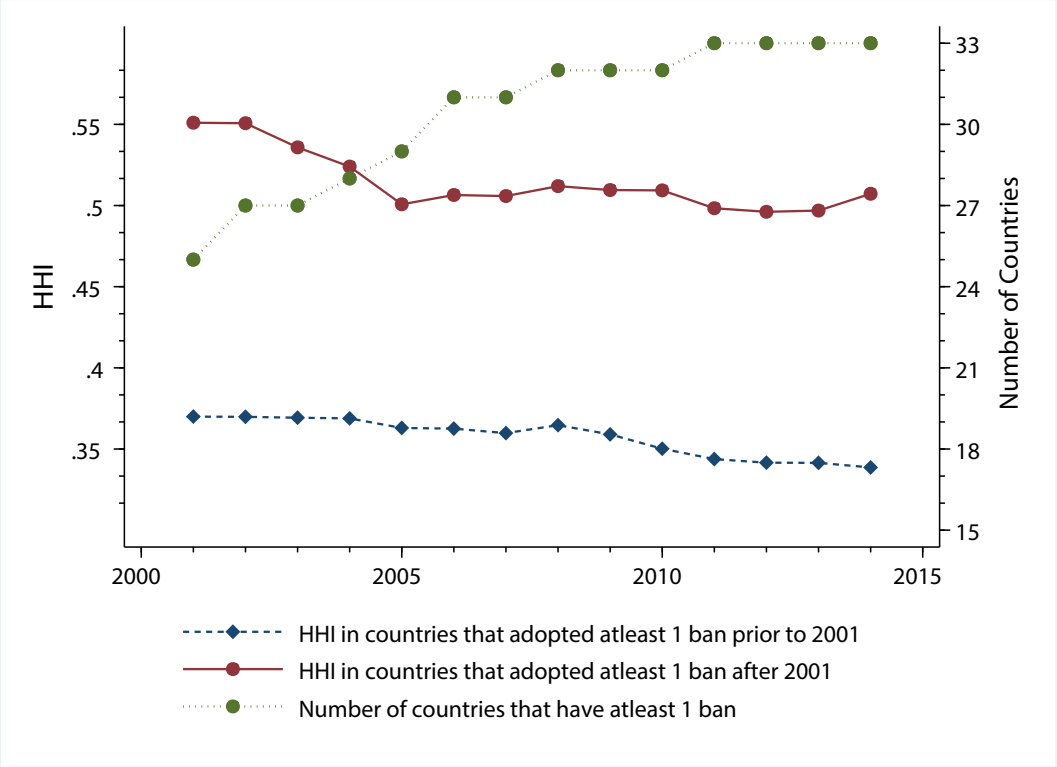
Figure 5a and 6a plot mean HHI, seven years before and seven years after the ban for developed and developing countries, respectively. There are two aspects, which taken together, present problems for drawing conclusions by looking at the group mean. First, there are fixed differences in the cigarette industry across countries, which translate to differences in the level of

HHI. Second, there is variation in timing of adoption, which implies that data is not available for years shown for all countries. That is, the composition of countries that make up the mean is different for each year. Taken together, a graph of group means before and after presents an awkward picture. For example, in figure 5a the only developed countries that have information available for more than five years are two relatively concentrated cigarette markets of Argentina and Uruguay; inclusion of other countries in year five shows a sharp decline in the mean. The same applies to figure 6a.

To draw more useful conclusions, in figure 5b and 6b, I plot HHI for countries that have data for more than 5 years pre- and post- adoption of ban. The idea is to provide an indication for the direction of the effect of an advertising ban on market-concentration. Figure 5b shows that there is no particular effect of the ban in developed countries. Apart from a sharp rise in Uruguay and slight movement in Spain, HHI remains stable before and after the ban. In contrast, figure 6b shows a sharp rise in HHI one and two years after adoption in developing countries. In Kenya, however, there is no change. Note that the magnitude of the rise is different for each country. Philippines shows the highest magnitude, followed by Peru, and then Colombia.

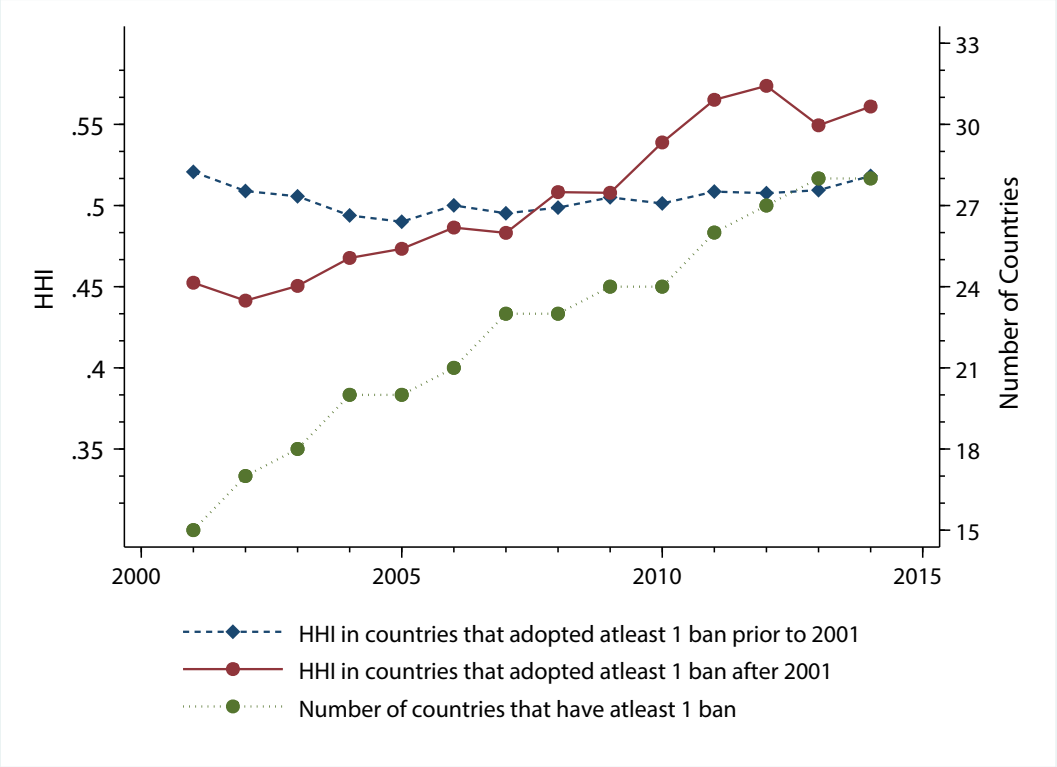
Figures 2-6 present three important points. First, growth in HHI pre- and post adoption of bans suggests that the impact varies by income-status of the country. There is no indication of a significant change in concentration in developed countries; whereas, there is a rise in concentration in developing countries after the ban. Second, a sharp rise in HHI appears a year or two after the adoption of the ban. This is consistent with the argument in section 2 that the existing stock from past advertising will take time to depreciate. Third, the magnitude of the change in HHI is different for each country indicating heterogeneous effects of the ban. This is relevant to the interpretation of the treatment effect, as discussed below.

Figure 3. Market-concentration, HHI, in developed countries, and number of countries adopting atleast 1 media ban.



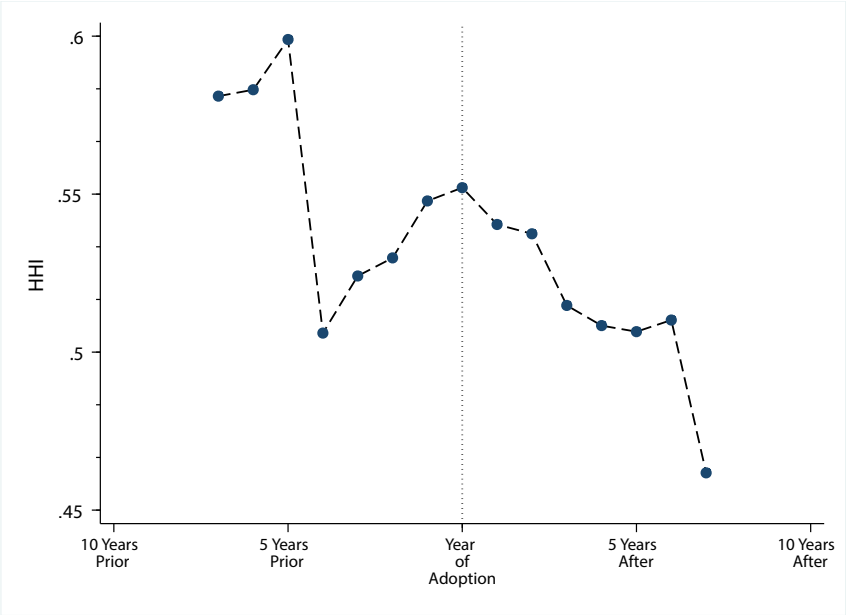
Notes: High income countries (>($12,745) are classified as developed. Number of developed countries in the sample is 34, 8 adopted a ban between 2001 and 2014. Overall mean HHI is 0.39.
Sources: World Health Organization (WHO)'s Tobacco Restriction Policy Data (MPOWER), WHO Regional Office for Europe, ERC Group Research Reports, Tobacco Control Laws.org, press releases and previous literatur; Euromonitor Passport Database, editions 2011, 2014 and 2015.

Figure 4. Market-concentration, HHI, in developing countries, and number of countries adopting atleast 1 media ban.

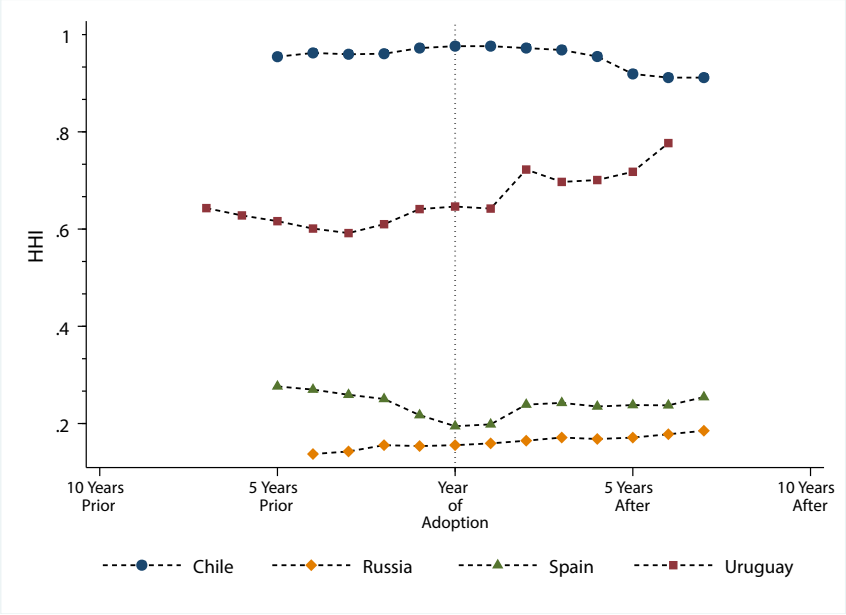


Notes: Middle- ($1,046 - $12,745) and low-income countries ($\leq$$1045) are classified as developing countries. Number of developed countries in the sample is 31, 11 adopted a ban between 2001 and 2014. Overall mean HHI is 0.51.
Sources: World Health Organization (WHO)'s Tobacco Restriction Policy Data (MPOWER), WHO Regional Office for Europe, ERC Group Research Reports, Tobacco Control Laws.org, press releases and previous literatur; Euromonitor Passport Database, editions 2011, 2014 and 2015.

Figure 5. Market-concentration, HHI, in developing countries, before and after adoption of an advertising ban.

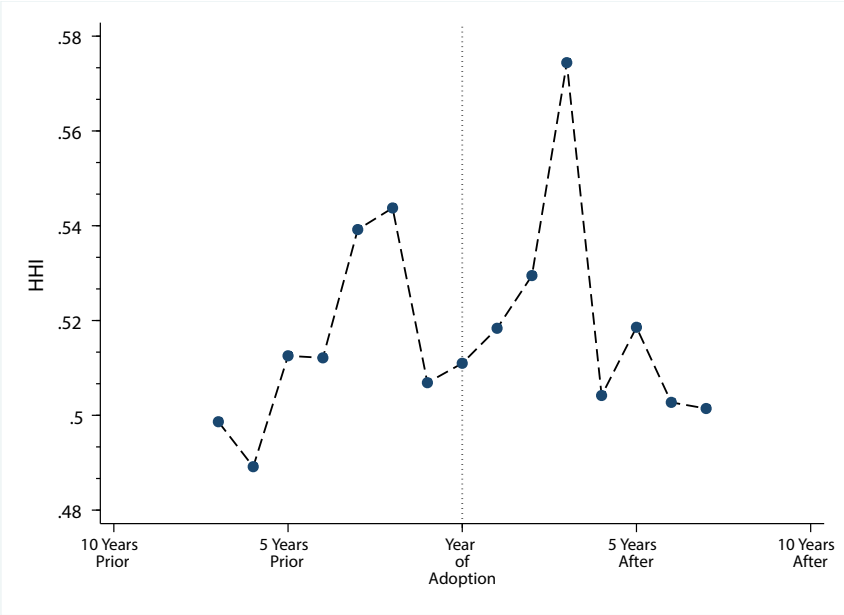


(a) *All developed countries*

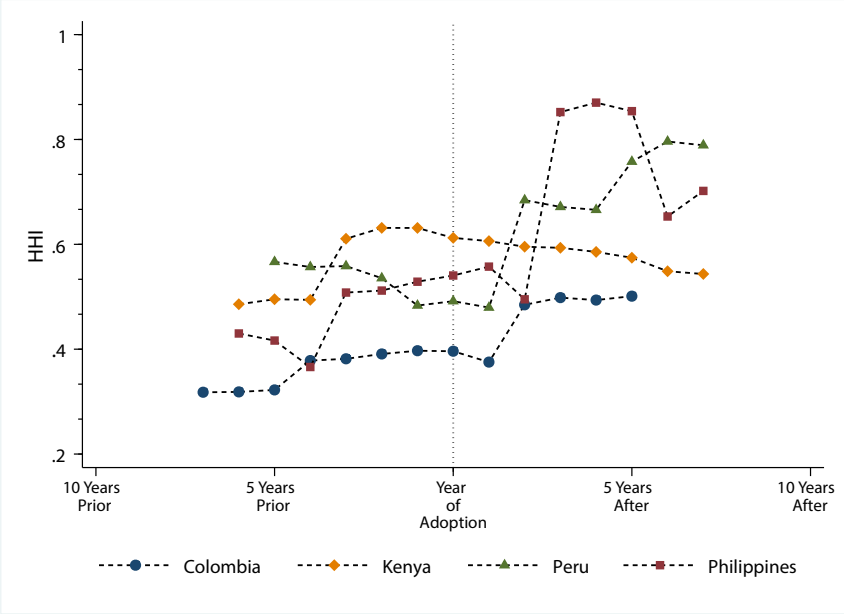


(b) *Four developed countries*

Figure 6. Market-concentration, HHI, in developing countries, before and after adoption of an advertising ban.



(a) *All developing countries*



(b) *Four developing countries*

TABLE II. SUMMARY STATISTICS, 2001-2014

	All		Developed		Developing	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
HHI	0.45	0.21	0.39	0.18	0.51	0.22
Ban	0.81	0.39	0.89	0.31	0.72	0.45
Price *(US$)*	3.29	2.70	4.66	3.04	1.79	0.95
Population, Female *(% of total)*	50.21	3.12	50.16	4.18	50.26	1.10
Unemployment, Total *(% of total labor force)*	8.14	4.66	7.72	4.07	8.59	5.20
Total Smoking Prevalence *(% Adult Pop)*	0.24	0.08	0.26	0.07	0.23	0.08
FDI, Inward *(% of GDP)*	3.42	4.37	3.61	4.52	3.22	4.19
Export *(Volume in Mn)*	12,972.11	26,983.41	19,932.16	35,065.26	5,338.50	8,247.23
Import *(Volume in Mn)*	9,581.94	17,196.93	15,567.46	21,652.58	3,017.18	4,893.62
Production *(Volume in Mn)*	82,607.64	273,803.00	56,529.18	103,482.10	111,209.80	379,560.50
GDP per capita *(Constant 2005 US$)*	16,849.27	17,333.24	29,274.14	15,691.02	3,221.99	2,188.34
	N=910		*N=476*		*N=434*	

Notes: This table shows summary statistics for all countries in the sample, as well as the sub-groups: developed and developing countries. High-income countries (>$12,745) are classified as developed; middle- ($1,046 - $12,745) and low-income countries (≤$1045) are classified as developing countries.
Sources: Euromonitor International Limited, United Nations Conference on Trade and Development (UNCTAD), Economist Intelligence Unit (EIU), World Health Organization (WHO), and World Bank.

E. Other Variables and Summary Statistics

Summary statistics for the variables used in the analysis are shown in Table II. Statistics for developed and developing countries are shown separately.

As mentioned earlier, mean HHI in the sample is 0.45. To provide a reference, U.S. Department of Justice, categories an HHI of 0.18 or higher to be 'highly concentrated.' Developing countries are more concentrated (0.51) than developed countries (0.39). About eighty percent of the sample is covered under at least one medium of advertising ban. More developed countries have adopted a ban earlier in the period, approximately ninety percent of this subsample is covered, while developing countries are lagging behind with seventy-two percent coverage.

There are some prominent differences in other variables. Cigarette prices are twice as high in developed countries; while cigarette production is almost twice as high in developing countries. Another noticeable difference is the trade activity: developed countries, on average, have higher exports and imports. Smoking prevalence and foreign direct investment are also higher in developed countries.

1.5 Empirical Strategy

The goal of this empirical work is to identify the effect of advertising restrictions on market-concentration. I define 'restriction' as a complete advertising ban on at least one medium. Different countries adopted these bans at different times. I exploit this variation in adoption of bans in countries and years to assess the causal relationship between market-concentration and advertising bans. That is, I contrast market-concentration measures across countries and measure the change in treatment group relative to the control group. In this case, countries that adopted first ban during the period 2001 to 2014 form the 'treatment' group. 'Control' group comprises countries that adopted at least one ban prior to 2001 plus countries that have no advertising bans as of 2014. Identifying causal effect requires controlling for any systematic shocks to market-concentration in treatment group that are correlated with, but not due to, the ban.

Specifically, I estimate difference-in-difference models of the form:

$$Y_{jt} = \alpha + \delta ban_{jt} + \mu_j + \tau_t + \epsilon_{jt} \tag{3}$$

where the dependent variable is market-concentration measure in country j in year t, and the independent variable is a dummy equal to 1 if a ban is present in country j at year t and 0 otherwise. In addition, the equation includes a vector of country dummies, μ_j, that controls for mean differences in market-concentration across countries, and year dummies, τ_t, that control for temporal changes in market-concentration common to all countries. Some models also control for socio-economic characteristics, trade statistics, and cigarette prices. The coefficient of interest is δ, which measures the change in market-concentration due to adoption of the ban.

Ideally, the adoption of a ban will be an independent event that varies in timing and has no spillover effects to other countries. If bans are independent and if no other country characteristic, correlated with change in restrictions, is important to the determination of market-concentration, equation (1) yields an unbiased estimate of the average treatment effect, δ.

A. Potential threats to Identification

A potential concern for identification in the present study is that advertising restrictions may not

be independent events. There are two main complications in studying the effect of advertising restrictions on market-concentration: trade and investment liberalization, and socioeconomic factors.

The first complication is the trend toward trade and investment liberalization. 'Liberalization' is the term used for removing government restrictions on cross-border trade through bilateral, regional and multilateral trade agreements. Increasing evidence shows that liberalization intensifies competition and promotes consumption. The main international institution governing internal trade is the World Trade Organization (WTO) formed in 1994. The WTO includes four prominent treaties: the General Agreement on Trades and Tariffs (GATT 1994), the Technical Barriers on Trade Agreement (TBT), the General Agreement on Trade and Services (GATS) and the Trade Related Aspects of Intellectual Property Rights (TRIPS). In a review of the implications of trade agreements on the tobacco industry in 2000, Chaloupka and Nair conclude that liberalization of trade in tobacco leads to lower prices in the importing country and higher consumption indicating declining market-concentration. Another prominent study conducted by Taylor, Chaloupka, Guindon, et al in 2000, estimates that 'trade-openness' has a large impact on consumption in low-income countries, smaller impact on middle-income countries and no impact in high-income countries. The suggestion here is the diminishing marginal effect of openness as openness rises: low-income economies, which are historically less open, see the largest impact; while high-income economies, which have relatively fewer barriers to trade, see no effect of openness.

Similar conclusions have been made regarding foreign direct investment and privatization of state-owned monopolies. Before 1980's, tobacco industries in Asian markets of Japan, Taiwan, South Korea, and Thailand were monopolized; state-run monopolies, protected by tariff and non-tariff barriers, controlled over 90 percent of the market. Under the threat of US trade sanctions, these markets were opened to imports in 1980's, leading to a dramatic increase in market-share of foreign brands relative to domestic brands (Chaloupka and Laixuthai, 1996). In Taiwan, imports increased from 2 percent of market share in 1986 (prior to market opening) to 28 percent in 1992 (Wen, Chang, Erikson, et al, 2005). A series of papers by Gilmore and McKee (Gilmore and McKee, 2004; 2005; 2011) studying the tobacco industry's transition in Former Soviet Union (FSU), found that within eight years 1992-2000, the transnational tobacco

companies invested over $2.7 billion in 10 out of 15 states. Additionally, presence of transnational tobacco companies, whether through imports or production, is associated with dramatic increases in advertising and promotion. Transnational companies were identified as the largest advertisers in Russian television and radio; and were ranked among the top three advertisers in four of the Former Soviet States. In Taiwan, from 1995 to 2000, total expenditures on tobacco advertising increased by more than five times (451%).

This trend toward liberalization also has implications for country's regulatory environment. In the 2004 study, Gilmore and McKee find a correlation between foreign direct investment by transnational companies in FSU states and tobacco control laws: in countries where investment was large, tobacco control laws were relatively weak. The descriptive evidence provided in their study suggests that privatization and higher foreign direct investment increases tobacco industry's political leverage with respect to tobacco regulation. Another study of internal industry documents conducted by Patel, Colin and Gilmore (2007) shows that tobacco companies have power to influence tobacco legislation. In Kenya, British American Tobacco has used its high-level political connections to influence public policy: 'health legislation has been diluted and delayed'.

Recent evidence also suggests that tobacco companies consistently use trade and investment agreements to challenge governments' legislative powers regarding tobacco control measures, through mechanisms such as litigation. The trade agreement directly relevant for the present study is the General Agreement on Trade and Services (GATS), a WTO agreement that extends trade rules to services such as advertising. The GATS requires non-discrimination between imported and domestically produced services; laws may not discriminate in their form (explicitly based on origin) or their effect (disproportionately affect imported services). In addition, GATS restricts countries from maintaining national monopolies, includes limitations on the total value of services supplied and limitation on the total number of service operations (Weissman, 2003).

Policy experts claim that GATS may be used to challenge advertising restrictions. This is so even if restrictions apply equally to domestic and foreign firms (McGrady, 2011). Consider the following scenario: a foreign advertising firm that specializes in television advertising may challenge a ban on television advertising if the ban does not extend to other media, on the grounds that a television advertising ban effects foreign firms disproportionately.

While there have been a number of disputes involving tobacco products, challenges

regarding advertising bans have not come to the WTO. Historically, there has been an example of advertising ban being upheld by trade panel under the GATT: the Thai Challenge by the United States in 1980s, in which the GATT tribunal invoked the health exception and declared that Thailand could ban tobacco advertising because it was non-discriminatory[3]. There have also been instances of advertising restrictions upheld by national governments following the same reasoning.

The second complication is the socio-economic processes of a country, meaning the conditions that policy makers take into account when recognizing and addressing problems. Factors such as prevalence, overall consumption, economic costs and benefits of tobacco use, and public's attitude toward smoking form the broader context that tobacco firms and regulators operate in. Regulators are more willing to introduce restrictions if socio-economic conditions are conducive to change. For example, countries with low prevalence and consumption, high health and economic burdens, and low opposition to tobacco regulation are expected to have stronger advertising restrictions. Cairney, Studlar and Maimudi (2011) examine the varied policy conditions across regions and find differences between between developed and developing countries. Overall, the socio-economic context facilitates tobacco control in developed countries: prevalence, economic value and resistance to tobacco control are generally falling; but it constrains the process in developing countries: economic value of tobacco may be relatively high, prevalence is often rising, and resistance to tobacco control remains strong.

This discussion informs of the potential threats to identification in an attempt to empirically analyze the effect of advertising restrictions on market-concentration. I address these concerns in the following two ways. The literature identifies a contrast between developed and developing countries. In the former, policy changes have taken place over an extended period of time driven by domestic institutions, efforts of public health groups, scientific knowledge and changing social attitudes and behaviors. In the latter, few domestically driven policy measures are apparent and domestic public health capacity is relatively low; policy has developed through policy transfer from developed countries led by institutions such as WHO, World Bank, and the UN, the most prominent contribution being the formation of the 2003 Framework Convention on Tobacco Control (FCTC). Moreover, trade environment and its impact on market is markedly different

[3]The Thailand case, however, may not be a binding precedent because WTO rules do not require dispute panels to follow precedent. Moreover, as the Thai decision predates the GATS, it is uncertain if the Thai ban on advertising can survive challenges under GATS (Zeigler, 2006).

between the two regions. Consequently, a study focused on all countries grouped together may have limited value. Instead, I show results separately for developed and developing countries.

Additionally, I augment equation (1) with a set of variables relating to trade and socio-economic characteristics of the country, and later add a richer set of covariates based on the discussion above to check for sensitivity of the baseline results.

B. Heterogeneity and Interpretation

The interpretation of the estimate obtained from difference-in-difference method will differ from an average treatment effect (ATE) in the presence of heterogeneity. As shown in figure 5 and 6, the magnitude of change in HHI after the ban varies across countries. In this case, the estimate is interpreted as treatment-on-the-treated (TOT) effect.

Aside from these concerns, this empirical strategy offers clear advantages over simpler comparisons. For example, within country comparisons will fail if there are policy-changes, or other omitted variables, that drive concentration in all countries at the same time. Similarly, using cross-section variation only, will not take into account country-specific characteristics, correlated with bans, that are important determinants of market-concentration.

1.6 Effect on Concentration

A. Effect on Concentration

Table III presents difference-in-difference (DID) estimates of advertising bans and market-concentration as measured by Herfindahl-Hirschman Index (HHI). Model I presents estimates for equation (1), that is, a regression of HHI on indicator variable for an advertising ban which is equal to 1 if a ban is present in a given country and year, and zero otherwise; Model II and III add controls to address concerns that liberalization, socio-economic context or other time-varying country specific variables are driving the results. Each model contains country and year dummies. Huber-White robust standard errors allow for arbitrary correlation of residuals within each country; all standard errors are clustered at country level.

The first column of Table III contains the estimated effect of advertising ban on HHI. The coefficient on *ban* for Model I indicates that after removing mean country HHI and common year effects, HHI increased by 0.06 points for those countries that adopted the ban between 2001 and 2014. Mean HHI in the sample is 0.45. This estimate, then, represents a 13 percent increase with respect to the mean. A ban on advertising will increase concentration if advertising has become more expensive. In this sense, the principal role of advertising is to create goodwill among consumers and increase their willingness to pay. An advertising ban increases the cost of firms to reach their consumers thereby restricting the ability to build up their goodwill. Firms then operate on the past stock of goodwill, which varies according to the size of the firm, but depreciates over time. Advertising ban disproportionately affects smaller firms, leading to an increase in market concentration.

Above interpretation of the coefficient relies on the assumption that there are no time-varying and country-specific effects correlated with advertising bans. In Model II, I add control variables to address the following concerns. First, that trade and investment liberalization restricts a country's regulatory freedom to impose advertising bans. Second, that socio-economic context of a country determines the county's advertising regulation. In Model III, I augment Model II by adding price as an additional control variable. Controlling for price is problematic since price changes may have occurred either because of shifts in demand caused by advertising ban or due to a change in market concentration. Yet, it is necessary to show whether price-control policies are driving changes in market-share. (As a sensitivity check, I substitute tax for price; estimates are discussed in section 6 B.) The results are shown in the second and third column of Table III.

After controlling for confounding factors, country effects and year effects, the coefficient on *ban* for Model II decreased by 0.002 points: HHI increased by 0.058 points for the countries that adopted the ban between 2001 and 2014. This estimate represents 12.8 percent increase with respect to the mean. Finally, in Model III, the coefficient decreases slightly to 0.05 after the addition of price. None of the other variables, apart from exports and imports, have a statistically significant association with HHI in either of the models.

Estimates in Table III suggest that adoption of advertising ban results in an increase in market concentration. This conclusion, however, is concerning. The main concern is that

developed and developing countries follow different trajectories with respect to tobacco control. In developed countries, policy changes have taken place over an extended period of time driven by domestic institutions, efforts of public health groups, scientific knowledge and changing social attitudes and behaviors. This brings up concerns for the empirical strategy, as policies may be endogenous to the country's environment. Few developing countries, on the other hand, have developed their tobacco control policy as a result of internal processes. Most developed it through policy transfer from developed countries and lag behind in terms of strength and pace of their advertising restrictions (Table 1). A stronger argument can be made against endogeniety of policies in developing countries due to strong documentation on the role of international organizations and FCTC in policy changes.

Given these concerns, I can usefully divide the dataset into two groups: developed countries, comprising mature markets with longstanding advertising restrictions; and developing countries, comprising expanding markets with relatively recent advertising restrictions. Table IV presents difference-in-difference estimates separately for the two groups. Panel A shows estimates of Model I, II, and III for developed countries; And Panel B for developing countries. Robust standard errors are shown in parentheses, clustered at country by country.

Table IV confirms the conclusion that developing countries see an increase in market-concentration after the ban, but shows no effect in developed countries. In Panel A, the estimated impact on HHI is statistically insignificant for developed countries. Not only are the coefficients insignificant, but they are also extremely small. Conditional on confounding variables, the estimated impact of an advertising ban on HHI is 0.01 for Model I and 0.02 for Model II and III.

Developing countries, on the other hand, follow a similar pattern to the pooled sample. The coefficient on *ban* in column 1 indicates that after removing mean country HHI and common year effects, HHI increased by 0.077 points for those countries that adopted the ban between 2001 and 2014. The impact of controls is higher for this group compared to the pooled sample. After conditioning on confounding variables in Model II (column 2), the coefficient on *ban* increased slightly: HHI increased by 0.081 points for the countries that adopted the ban between 2001 and 2014. The estimate represents 18 percent increase with respect to mean HHI of the whole sample (0.45), and about 16 percent increase with respect to mean HHI of developing countries (0.5). In

Model III (column 3), similar to the pooled sample, controlling for price affects the coefficient minimally: the estimated impact is 0.079 points. None of the other variables, apart from imports is statistically significant in either of the models.

The absence of an effect in developed countries is not surprising. As the discussion of adoption of advertising restrictions in section 4 demonstrates, many developed countries had already introduced a range of bans prior to 2001. Evidence also indicates that socio-economic context is more receptive to tobacco control in these countries, which has led to organized, broadly inclusive policies aimed at reducing tobacco use. As a result, smoking prevalence is on a decline. To state more formally, developed countries are at later stages of the 'tobacco epidemic model' as proposed by Lopez et al 1994: knowledge of smoking risks is widespread, effective systems to curb tobacco use are in place, and tobacco control has had a substantial success, resulting in falling smoking prevalence. In fact, the experience of most developed countries serves as a learning tool for other countries to intervene in earlier stages. In this light, the absence of an effect of an advertising ban on concentration, which is essentially driven by consumers' willing to pay, is not alarming.

On the other hand, the magnitude of the effect in developing countries is important. Developing countries are at different stages of the tobacco epidemic. Sub-Saharan African countries have low smoking rates and have not experienced the harmful effects of smoking; while Latin American and Caribbean countries, and Middle East and North African countries have started to experience the harmful effects (Cairney, Studlar and Mamudi, 2011; Shafey et al, 2009). Overall, smoking prevalence in developing countries is rising, which underpins the significance of effective advertising restrictions as a means of early intervention. The results in this section show that an advertising ban leads to an increase in market concentration. Economic theory suggests that an increase in concentration is most likely to increase price, reinforcing the direct effect on cigarette demand, leading to a negative impact on consumption-the indicated objective of the ban. However, there is an irony to these findings. Higher concentration in the cigarette industry implies an increase in market power of transnational tobacco companies. These companies are some of the most powerful and richest companies in the world, richer than most developing countries (WHO 2002). It is also widely documented that the presence and market-power of transnational tobacco companies is associated with an increase in smoking prevalence, especially

TABLE III. THE ESTIMATED IMPACT OF ADVERTISING BAN ON MARKET CONCENTRATION, 2001-2014

Variable	*HHI*		
	I	II	III
	(1)	(2)	(3)
Ban	0.060**	0.058**	0.049**
	(0.026)	(0.024)	(0.023)
GDP per capita *(Constant 2005 US$)*		-0.001	0.003
		(0.004)	(0.004)
Population, Female *(% of total)*		0.002	-0.007
		(0.018)	(0.018)
Unemployment, Total *(% of total labor force)*		-0.004	-0.003
		(0.002)	(0.002)
Smoking Prevalence, Total *(% Adult Pop)*		0.288	0.129
		(0.325)	(0.306)
FDI, Inward*(% of GDP)*		0.001	0.001
		(0.001)	(0.001)
Production *(Volume)*		2.75e-05	8.50e-07
		(3.10e-05)	(3.48e-05)
Export *(Volume)*		0.001*	0.001**
		(0.000)	(0.000)
Import *(Volume)*		-0.002***	-0.002***
		(0.001)	(0.001)
Price *(US$)*			-0.011**
			(0.004)
Country Fixed Effects	✓	✓	✓
Year Fixed Effects	✓	✓	✓
R^2	0.918	0.923	0.925

Notes: HHI=Herfindahl-Hirschman Index. *Mean HHI*=0.45. n=910. Standard Errors are clustered by country. *significant at 10%; **significant at 5%; ***significant at 1%.

among women (Chaloupka and Laixuthai, 1996; Samet and Yoon, 2001; Gilmore and McKee 2004, 2011). In this light, the magnitude of the effect of an advertising ban on concentration presents an important trade-off for policymakers: falling consumption may mean compromising on market power for tobacco companies.

B. Sensitivity Checks

I next perform sensitivity checks on baseline models to test the robustness of results. Estimates are found in Table V.

A first sensitivity check addresses the concern that price is not an appropriate control for price-related tobacco control policies. Price will reflect tax increases if price responsiveness to tax

TABLE IV. THE ESTIMATED IMPACT OF ADVERTISING BAN ON MARKET CONCENTRATION, 2001-2014: DEVELOPED VS. DEVELOPING COUNTRIES

Variable	*HHI*		
	I	II	III
	(1)	(2)	(3)
Panel A: Developed Countries			
Ban	0.012	0.022	0.016
	(0.033)	(0.032)	(0.032)
GDP per capita *(Constant 2005 US$)*		0.004	0.005
		(0.005)	(0.004)
Population, Female *(% of total)*		-0.020	-0.022
		(0.020)	(0.019)
Unemployment, Total *(% of total labor force)*		-0.002	-0.002
		(0.003)	(0.003)
Smoking Prevalence, Total *(% Adult Pop)*		0.152	0.097
		(0.318)	(0.314)
FDI, Inward*(% of GDP)*		0.002*	0.002**
		(0.001)	(0.001)
Production *(Volume)*		-0.000	-0.000
		(0.000)	(0.000)
Export *(Volume)*		0.001	0.001
		(0.000)	(0.000)
Import *(Volume)*		-0.001*	-0.001*
		(0.000)	(0.001)
Price *(US$)*			-0.004
			(0.005)
Country Fixed Effects	✓	✓	✓
Year Fixed Effects	✓	✓	✓
R^2	0.926	0.932	0.932
Panel B: Developing Countries			
Ban	0.077**	0.081**	0.079***
	(0.033)	(0.033)	(0.027)
GDP per capita *(Constant 2005 US$)*		-0.002	0.013
		(0.013)	(0.011)
Population, Female *(% of total)*		0.055	0.061
		(0.122)	(0.102)
Unemployment, Total *(% of total labor force)*		-0.004	-0.002
		(0.005)	(0.005)
Smoking Prevalence, Total *(% Adult Pop)*		-0.097	-0.202
		(0.660)	(0.618)
FDI, Inward*(% of GDP)*		-0.001	-0.002
		(0.001)	(0.001)
Production *(Volume)*		1.40e-05	-3.67e-05
		(3.70e-05)	(3.97e-05)
Export *(Volume)*		0.001	0.001
		(0.001)	(0.001)
Import *(Volume)*		-0.003*	-0.003**
		(0.002)	(0.002)
Price *(US$)*			-0.064***
			(0.022)
Country Fixed Effects	✓	✓	✓
Year Fixed Effects	✓	✓	✓
R^2	0.912	0.917	0.926

Notes: HHI=Herfindahl-Hirschman Index. Developed: *Mean HHI*=0.39, *n*=476. Developing: *Mean HHI*=0.51, *n*=434. Standard Errors are clustered by country. *significant at 10%; **significant at 5%; ***significant at 1%.

is assumed to be unity. That is not necessarily the case in the tobacco industry. In cases where sellers have market-power, price responsiveness may or may not be equal to unity. It is also important to note that there seems to be no association between concentration and taxation. In an examination of case studies of several countries, Perucic and Vellios (2013) note that there is 'no apparent association' between concentration and tax levels. Panel A of Table V substitutes tax for price in Model III. The coefficients are minimally affected by the inclusion of tax.

To explore whether the estimates may be driven by other non-tax tobacco control policies, I include in Panel B, an indicator variable, FCTC, which is equal to 1 if a country has ratified the Framework Convention on Tobacco Control (FCTC) and 0 otherwise. Ratification of FCTC indicates a country's formal consent to be bound by the laws put forth in FCTC. The indicator is meant to serve as a proxy for non-tax tobacco control measures. Column 1-3 and 4-6 show results for pooled sample and developed countries, respectively; the coefficients are similar to baseline results. Column 7-9 show results for developing countries, which obtain a coefficient of about 0.085 for Model II and 0.084 for Model III. The coefficients are slightly higher than baseline results, yet the qualitative conclusions are the same.

Third check addresses the concern that region-specific characteristics might be influencing the estimates. For example, the European Union (EU) has increasingly taken on the responsibility of tobacco control, acting as the center of policy-diffusion for member states and platform of influence for interest groups. Through passing regulations and binding directives, the EU has attempted to shape major tobacco control instruments such as advertising, and encouraged the wider process of voluntary transfer of ideas between member states and interest groups. EUs role is apparent particularly for accession states mandated to engage in tobacco controls as a condition of EU membership: Eight out of twelve recent accession members has no tobacco control restrictions before leaving Communism; while at the time of accession, they had a wide range of restrictions in place (Frisbee et al, 2009). Another example is that of former Soviet Union countries such as Russia and Ukraine. Despite being signatories to the FCTC, the global tobacco control regime has yet to have a significant impact on domestic policies. In Panel C of Table V, I add $region \times year$ trends to baseline Models II and III to absorb any region specific shocks. Again, the coefficients are insensitive to these additional covariates for all, developed, as well as developing countries.

Finally, I re-estimate baseline models using a restricted sample. Governments that hold a large stake in the tobacco industry may introduce advertising restrictions to limit competition by transnational tobacco companies. In Panel D of Table V, I exclude from the sample, those countries that have state monopolies or where government has a high share in the tobacco industry. The exclusion of these countries should reduce the chance of obtaining a positive effect on concentration as a result of bans. Column 1-3 and 4-6 show results for all countries and developed countries, respectively; the coefficients are similar to baseline results. Column 7-9 shows results for developing countries, which obtain a coefficient of about 0.076 for Model II and 0.071 for Model III. The coefficients are slightly lower than baseline results, yet still within the confidence intervals.

Estimates obtained in Table V confirm a significant effect of advertising ban on market concentration, as measured by HHI. To summarize, in the base specification, the point estimate is 0.060 for pooled sample and 0.077 for developing countries. After controlling for trade and socio-economic characteristics, the coefficient is minimally affected for the pooled sample and increases to 0.081 for developing countries. Coefficients for developed countries are extremely small and lack statistical significance.

TABLE V. THE ESTIMATED IMPACT OF ADVERTISING BAN ON MARKET CONCENTRATION, 2001-2014: SENSITIVITY CHECKS

Variable	*All*			*Developed*			*Developing*		
	I	II	III	I	II	III	I	II	III
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: *Inclusion of tax*									
Ban	0.060**	0.058**	0.056**	0.012	0.022	0.028	0.077**	0.081**	0.075**
	(0.026)	(0.024)	(0.025)	(0.033)	(0.032)	(0.035)	(0.033)	(0.033)	(0.032)
Trade Statistics		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Tax			Yes			Yes			Yes
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.918	0.923	0.923	0.926	0.932	0.933	0.912	0.917	0.918
Panel B: *Inclusion of FCTC as proxy for non-price tobacco control policies*									
Ban	0.060**	0.059**	0.050**	0.012	0.020	0.014	0.077**	0.085**	0.084***
	(0.026)	(0.025)	(0.024)	(0.033)	(0.031)	(0.031)	(0.033)	(0.035)	(0.028)
FCTC		Yes	Yes		Yes	Yes		Yes	Yes
Trade Statistics		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Price			Yes			Yes			Yes
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.918	0.923	0.925	0.926	0.932	0.933	0.912	0.917	0.927

Notes: HHI=Herfindahl-Hirschman Index. Developed: *Mean HHI*=0.39. Developing: *Mean HHI*=0.51. Standard Errors are clustered by country. *significant at 10%; **significant at 5%; ***significant at 1%.

TABLE V. THE ESTIMATED IMPACT OF ADVERTISING BAN ON MARKET CONCENTRATION, 2001-2014: SENSITIVITY CHECKS *(cont.)*

Variable	*All*			*Developed*			*Developing*		
	I	II	III	I	II	III	I	II	III
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel C: *Inclusion of region-specific trends*									
Ban	0.060**	0.059**	0.049**	0.009	0.020	0.014	0.076**	0.078**	0.078***
	(0.026)	(0.025)	(0.023)	(0.033)	(0.032)	(0.032)	(0.033)	(0.034)	(0.027)
Trade Statistics		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Price			Yes			Yes			Yes
Region Specific Trend	✓	✓	✓	✓	✓	✓	✓	✓	✓
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.919	0.924	0.926	0.928	0.934	0.934	0.914	0.917	0.927
Panel D: *Exclusion of state-monopolies*									
Ban	0.063**	0.061**	0.050*	0.014	0.023	0.017	0.071*	0.076**	0.071**
	(0.028)	(0.026)	(0.025)	(0.039)	(0.037)	(0.036)	(0.036)	(0.035)	(0.027)
Trade Statistics		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Price			Yes			Yes			Yes
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.872	0.880	0.884	0.897	0.905	0.906	0.854	0.861	0.878

Notes: HHI=Herfindahl-Hirschman Index. Developed: *Mean HHI*=0.39. Developing: *Mean HHI*=0.51. Standard Errors are clustered by country. *significant at 10%; **significant at 5%; ***significant at 1%.

C. Timing of Adoption and Identifying Assumption

To explore the dynamics of the advertising ban, instead of a simple ban indicator, I use a series of dummy variables indicating time relative to adoption to estimate the effect of advertising ban. Specifically, I estimate difference-in-difference models of the form:

$$Y_{jt} = \alpha + \sum_{k=-10}^{10} \delta_k ban_{jt} + \gamma X_{jt} \times \tau_t + \mu_j + \tau_t + \epsilon_{jt} \tag{4}$$

where the dependent variable is HHI in country j in year t, and $ban_{k,jt}$ is a dummy variable equal to 1 if a country is k years relative to the adoption of a ban and zero otherwise. In addition, the equation includes a vector of country dummies, μ_j, that controls for mean differences in market-concentration across countries; year dummies, τ_t, that controls for temporal changes in market-concentration common to all countries; and trade and socio-economic variables interacted with time dummies to control for any additional variation that may be driving the results, $X_{jt} \times \tau_t$. The coefficients δ_k for $k > 0$, measure the change in market-concentration due to adoption of the ban.

An advantage of this model is that it allows for partial test of the identifying assumption, that is, in the absence of adoption of an advertising ban, HHI would have trended similarly in countries adopting bans at different times. If the timing of adoption is unrelated to underlying trends and tobacco industries within countries do not respond before adoption, there should be no trend in the δ_k for $k \leq 0$.

Taken as a whole, the pattern of δ_k's describes the change in trend in HHI associated with adoption of advertising bans. Estimates are found in Table VI. Note that the indicator for year 10 is equal to 1 for each subsequent year, starting with year 10; similarly the indicator for year 10 prior to the ban is equal to 1 for year 10 and prior years. Note also that since countries adopt bans in different years, the composition of countries identifying δ_k varies with k. In the presence of heterogeneity, the pattern of the δ_k's reflects changes in the composition of countries that identify the coefficient as well as the dynamics of the effect of advertising ban. For example, if effect of the ban is higher for countries that have adopted the ban later in the study period, the δ_k's for later years will be smaller than the years closer to the ban. Similarly, estimates of

pre-trend may also be affected by compositional changes. This does not represent a violation of the identifying assumption; it is interpreted as a heterogeneous treatment effect. Finally, note that the omitted category is the year before adoption of ban.

Column 1 of table 6 presents estimates for the pooled sample. All coefficients in this column lack statistical significance. The coefficients on ban leads four and more years prior to adoption range between -0.09 to -0.05; after which the coefficients are close to zero until second year of adoption; from year three to six, the coefficient remains between 0.04 to 0.03; in seventh year the coefficients start to decline and fall close to zero. Column 2 in table 6 presents estimates for developed countries, showing a clear positive trend before the adoption of ban. Following the adoption, coefficients are stable and close to zero. After eighth year, the coefficient fluctuates between 0.05 to 0.06. As with the pooled sample, all coefficients lack statistical significance. Taking the estimates in this column, previous estimates in the study, and trends shown in figure 3, and 5 together, it is most likely that compositional changes are driving the results before adoption in this specification. Most developed countries had advertising bans prior to 2001, and the changes occurred earlier in the period of study. Thus, lack of information for years leading up to adoption of bans make it hard to estimate the trend for pre-ban years. Moreover, estimates for developed countries may be biasing results for the pooled sample as well.

The third column of table 6 presents estimates for developing countries. The coefficients on ban leads four and more years prior to adoption range between -0.07 to -0.05; however, the standard errors are very high for these estimates. The coefficient of ban leads are close to zero, showing little evidence of an anticipatory response within developing countries about to adopt an advertising ban. In the second year of adoption, HHI increases slightly; in the third year, HHI increases substantially by 0.07 points, after which the coefficients fluctuate between 0.07 to 0.10 points till year eight; the coefficient then averages 0.07 points in subsequent years. The pattern of coefficients prior to the ban provides robust evidence that adoption of the ban led to HHI increase rather than vice-versa in developing countries.

Next, I draw one final conclusion about trends by estimating the level and trend in HHI before the adoption of ban, and changes in level and trend in HHI, after the adoption of ban.

Specifically, I estimate regression model of the form:

$$Y_{jt} = \alpha + \delta ban_{jt} + \gamma T_t + \gamma' T'_t + \mu_j + \epsilon_{jt} \tag{5}$$

where the dependent variable is HHI in country j in year t, and the independent variable is a dummy equal to 1 if a ban is present in country j at year t and 0 otherwise. A yearly variable, T, is the trend before the adoption of ban, and T' is the trend after the ban. In addition, the equation includes a vector of country dummies, μ_j, which controls for mean differences in market-concentration across countries.

The coefficient, δ, measures the change in the level of market concentration due to adoption of the ban; it represents the immediate effect of the ban on HHI. The coefficient, γ, measures the average change in HHI per year; it denotes the underlying trend. The coefficient, γ', measures the change in trend after the adoption of the ban; it is interpreted as the gradual change in the underlying trend of HHI.

Estimates of this regression are found in Table VII, for all, developed and developing countries in column 1, 2 and 3 respectively. Overall, coefficients on trend variables, T and T', suggest that there is neither an underlying trend nor a change in trend following the adoption of the ban. The main impact is a change in the level of market-concentration. The coefficient on ban in column 1 indicates that after removing mean country HHI, and before and after trends, HHI increased by 0.068. This coefficient is directly comparable to table 3, column 1, which contains a coefficient of 0.060. In developing countries, the effect is higher: HHI increased by 0.073 points, directly comparable to a coefficient of 0.077 in table 4, column 1. Similar to the estimates in rest of the study, I see no effect of the ban on market concentration in developed countries. Thus, table 7 provides further support for the empirical strategy.

TABLE VI. THE DYNAMICS OF THE EFFECT OF ADVERTISING BAN ON MARKET CONCENTRATION, 2001-2014

Variable	All	Developed	Developing
	II	II	II
	(1)	(2)	(3)
$ban_{t\text{-}10 \text{ or more}}$	-0.04	-0.64*	-0.004
	(0.18)	(0.36)	(0.28)
$ban_{t\text{-}9}$	-0.09	-0.55*	-0.07
	(0.16)	(0.32)	(0.24)
$ban_{t\text{-}8}$	-0.07	-0.35	-0.06
	(0.12)	(0.25)	(0.20)
$ban_{t\text{-}7}$	-0.07	-0.32	-0.07
	(0.01)	(0.21)	(0.17)
$ban_{t\text{-}6}$	-0.07	-0.24	-0.05
	(0.07)	(0.17)	(0.13)
$ban_{t\text{-}5}$	-0.06	-0.12	-0.05
	(0.05)	(0.12)	(0.096)
$ban_{t\text{-}4}$	-0.05	-0.09	-0.04
	(0.04)	(0.08)	(0.07)
$ban_{t\text{-}3}$	-0.003	-0.03	0.001
	(0.02)	(0.05)	(0.04)
$ban_{t\text{-}2}$	0.007	0.004	0.01
	(0.01)	(0.03)	(0.02)
ban_{t}	0.007	0.03	0.005
	(0.01)	(0.03)	(0.02)
ban_{t+1}	0.01	0.02	-0.0007
	(0.02)	(0.03)	(0.03)
ban_{t+2}	0.02	0.009	0.02
	(0.02)	(0.05)	(0.04)
ban_{t+3}	0.04	-0.02	0.07
	(0.03)	(0.05)	(0.05)
ban_{t+4}	0.03	-0.01	0.06
	(0.04)	(0.07)	(0.06)
ban_{t+5}	0.03	-0.01	0.09
	(0.04)	(0.07)	(0.06)
ban_{t+6}	0.03	-0.005	0.091
	(0.04)	(0.08)	(0.06)
ban_{t+7}	0.02	-0.03	0.07
	(0.04)	(0.08)	(0.06)
ban_{t+8}	0.009	-0.05	0.10
	(0.05)	(0.09)	(0.07)
ban_{t+9}	-0.006	-0.05	0.08
	(0.05)	(0.097)	(0.08)
ban_{t+10}	-0.006	-0.06	0.06
	(0.05)	(0.096)	(0.08)
Controls	Yes	Yes	Yes
Country Fixed Effects	✓	✓	✓
Year Fixed Effects	✓	✓	✓
R^2	0.936	0.960	0.944

Notes: HHI=Herfindahl-Hirschman Index. Developed: *Mean HHI*=0.39, n=476. Developing: *Mean HHI*=0.51, n=434. All models include trade statistics, socio-economic controls, years since first ban, country and year effects, as indicated above. Standard Errors are clustered by country. *significant at 10%; **significant at 5%; ***significant at 1%.

TABLE VII. BEFORE- AND AFTER TREND AND THE ESTIMATED IMPACT OF ADVERTISING BAN ON MARKET CONCENTRATION, 2001-2014

Variable	All	Developed	Developing
	II	II	II
	(1)	(2)	(3)
Ban	0.068***	0.036	0.073**
	(0.025)	(0.027)	(0.034)
Slope Before	-0.000	-0.002	0.003
	(0.002)	(0.002)	(0.003)
Slope After	-0.003	-0.008	0.000
	(0.005)	(0.006)	(0.006)
Country Fixed Effects	✓	✓	✓
R^2	0.918	0.929	0.911

Notes: HHI=Herfindahl-Hirschman Index. Developed: *Mean HHI*=0.39, n=476. Developing: *Mean HHI*=0.51, n=434. Standard Errors are clustered by country. *significant at 10%; **significant at 5%; ***significant at 1%.

D. Does the Level of Restriction Matter?

The results so far suggest that the introduction of a tobacco-advertising ban leads to an increase in market-concentration in the cigarette industry in developing countries, and has no effect on concentration in developed countries. They, however, do not make a distinction regarding which medium of advertising is banned, or how many media are banned, that is, the strength of advertising restrictions; but simply look at the fact that there is a ban adopted by the country.

Previous literature on the effect of advertising bans on consumption indicates the importance of looking at the effect of 'comprehensive' advertising restrictions (Saffer and Chaloupka, 2000). Merely having any ban in the country will not have a significant impact, as firms can substitute their efforts toward the unrestricted medium of advertising. Several alternatives have been used to classify restrictions such as: i) a bounded score from 0 to 10 (Laugesen and Meads, 1991); ii) dummy variables for *warning requirements*, *tv & radio* bans, *moderate* bans (4 media banned), and *strong* bans (5 or more) (Nelsen 2003); and iii) dummy variables for *weak* (0-2), *limited* (3-4) and *comprehensive* (5 or more) (Saffer and Chaloupka, 2000; Blecher, 2008). While these authors provide useful ways to characterize comprehensive bans, there is still some ambiguity in literature regarding how to measure, classify, and interpret the level of restrictions mainly due to the subjective nature of these classifications[4].

To examine the effect of the level of restrictions I follow Saffer and Chaloupka (2000)'s approach and introduce three new variables designed to measure *weak*, *limited* and *comprehensive* regulations. Each set is defined in two ways. The first definition is based on the idea that larger number of media bans leads to a more comprehensive restrictions. Policies are assigned as *weak* if there is no complete ban on any media, or have partial bans on any media; *limited* if one or two media are banned; and *comprehensive* if four or more media are banned. The second definition uses specific media bans to define policies. While the definition of a *weak* policy is the same, policies are assigned as *limited* if either tv & radio are banned, or tv & radio as well as billboards are banned; and *comprehensive* if tv & radio, billboards and any other media are banned.

This classification, as slightly differs from existing literature, is motivated by three considerations. First, tv & radio are traditionally the most important media for tobacco

[4]See Blecher (2008) for detailed discussion on each classification.

advertising. They are always combined together, especially after year 2000, and are also the first media to be restricted or banned. To be precise, if there is only one media banned in a country, it is almost always tv & radio. Assigning a weak status to ban on tv & radio misrepresents the strength of the policy. Second, previous literature includes sponsorships, an indirect form of advertising, in their analysis. The present study is focused on direct forms of advertising. Third, broadly, the classification into different levels of policy is based on evidence, from journal papers, newspaper articles, etc., on the importance of advertising media to consumption.

The level of restrictions or strength of policy can be studied within the same regression framework described in section 4. In this section, I substitute *ban* dummy with two dummies, *limited* and *comprehensive*, indicating the level of restrictions present in a country and year. Estimates are found in Table VIII. Model I presents estimates for equation (1); Model II adds controls for trade and socio-economic characteristics; and Model III adds price. In both these models, I add an additional control variable measuring years since first ban. As discussed in section 3, countries take different course to stronger restrictions: some countries make incremental changes over an extended period of time, others have spurts concentrated in a few years. The variable is meant to account for different impacts for countries that switch policy from limited to comprehensive and countries that switch from weak/no ban to comprehensive. Panel A presents results using the first definition for *weak*, *limited* and *comprehensive* policies; Panel B presents the second. The dependent variable in this table is HHI. Robust standard errors are shown in parentheses, clustered at country level.

Consistent with recent literature on the effects of advertising restrictions on consumption (Saffer and Chaloupka, 2000; Blecher, 2008), Panel A shows that having a more comprehensive level of regulation leads to larger effect on the market. I begin with the overall sample in column 1-3 that yields a coefficient of 0.052 on *limited* and 0.059 on *comprehensive* for Model III. As with the previous section, advertising restrictions have no effect on HHI in developed countries (col 4-6). Developing countries (col 7-9), on the other hand, experience an increase in HHI of 0.047 points under a limited policy, and 0.095 points under a comprehensive policy conditional on other covariates.

Panel B uses the second definition for strength of policy. The most prominent differences between the two panels is that the coeficient on *limited* lacks significance in panel B, that is, when

defined with specific media. This indicates that a ban only on tv & radio and billboards does not have a significant effect on HHI. The coeficients on *comprehensive* are positive and statistically significant, but slightly differ in magnitude compared to panel A. In the pooled sample (col 1-3), the coefficient on *comprehensive* is 0.067 in Model II and decreases to 0.056 in Model III after inclusion of price as a control variable. For developing countries (col 7-9), the coefficients are higher, 0.083 in Model II and 0.076 in Model III.

Table VIII reveals that strength of advertising restriction correlates with an increase in market-concentration, as measured by HHI. Whether the strength is defined using the first or second method, coefficients on *comprehensive* dummies are statistically significant and positive. The coefficients on *limited*, however, are dependent on the classification. *Limited* policies have a small effect on advertising restrictions in panel A, but show no statistically significant effect in panel B. The sensitivity of the coefficients to different classifications is problematic, and suggests the necessity of finding a consistent method to define strength of policies.

TABLE VIII. THE ESTIMATED IMPACT OF ADVERTISING BAN ON MARKET CONCENTRATION, 2001-2014: LEVEL OF RESTRICTION

Variable	*All*			*Developed*			*Developing*		
	I	II	III	I	II	III	I	II	III
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: *Weak=no ban, Limited=2 or 3 bans, Comprehensive=4 or more bans.*									
Limited	0.075**	0.052**	0.038*	0.031	0.032	0.021	0.075*	0.047*	0.042
	(0.033)	(0.023)	(0.021)	(0.042)	(0.031)	(0.031)	(0.037)	(0.027)	(0.027)
Comprehensive	0.053**	0.059**	0.047**	0.002	0.008	-0.002	0.078**	0.095***	0.086***
	(0.025)	(0.023)	(0.021)	(0.032)	(0.030)	(0.027)	(0.035)	(0.034)	(0.025)
Trade Statistics		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Years since First Ban		Yes	Yes		Yes	Yes		Yes	Yes
Price			Yes			Yes			Yes
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.919	0.926	0.928	0.928	0.935	0.936	0.912	0.924	0.935
Panel B: *Weak=no ban, Limited=tv & radio, or tv & radio plus billboards, Comprehensive=tv & radio, billboards and more bans.*									
Limited	0.033	0.0218	0.014	-0.015	0.008	0.002	0.066	0.037	0.060
	(0.027)	(0.022)	(0.021)	(0.034)	(0.027)	(0.028)	(0.048)	(0.041)	(0.039)
Comprehensive	0.065**	0.067***	0.056**	0.021	0.024	0.017	0.078**	0.083**	0.076***
	(0.026)	(0.024)	(0.023)	(0.035)	(0.033)	(0.033)	(0.033)	(0.033)	(0.026)
Trade Statistics		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Years since First Ban		Yes	Yes		Yes	Yes		Yes	Yes
Price			Yes			Yes			Yes
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.919	0.925	0.927	0.928	0.936	0.937	0.912	0.919	0.929

Notes: HHI=Herfindahl-Hirschman Index. Developed: *Mean HHI*=0.39, n=476. Developing: *Mean HHI*=0.51, n=434. Both panels include additional control variable measuring years since first ban. Standard Errors are clustered by country. *significant at 10%; **significant at 5%; ***significant at 1%.

1.7 Effect on Consumption

In this section, I apply the same empirical strategy to estimate the effect of advertising restrictions on consumption. Specifically, I estimate difference-in-difference models of the form:

$$Y_{jt} = \alpha + \delta ban_{jt} + \mu_j + \tau_t + \epsilon_{jt} \tag{6}$$

where the dependent variable is logged consumption per capita in country j in year t, and the independent variable is a dummy equal to 1 if a ban is present in country j at year t and 0 otherwise. In addition, the equation includes a vector of country dummies, μ_j, that controls for mean differences in market-concentration across countries, and year dummies, τ_t, that control for temporal changes in market-concentration common to all countries. Some models also control for socio-economic characteristics, market-concentration, and cigarette prices. The coefficient of interest is δ, which measures the change in consumption due to adoption of the ban.

Table IX presents the results. Model I presents estimates for equation (6), that is, a regression of logged consumption per capita on indicator variable for an advertising ban which is equal to 1 if a ban is present in a given country and year, and zero otherwise; Model II adds controls for price, unemployment, percent of female population, and an indicator measuring the number of years since advertising first ban was introduced in the country; Model III adds HHI. Each model is estimated for all, developed, and developing countries separately. Huber-White robust standard errors allow for arbitrary correlation of residuals within each country; all standard errors are clustered at country level.

None of the models estimated in this table produce a statistically significant association between log of consumption per capita and advertising ban. In Column 1, the coefficient on *ban* for Model I indicates that after removing mean country consumption per capita and common year effects, logged consumption per capita increased by 0.06 points for those countries that adopted the ban between 2001 and 2014. After controlling for confounding factors, country effects and year effects, the coefficient on *ban* for Model II decreased to 0.001 points. Finally, in Model III, the coefficient increases to 0.005 after the addition of HHI. Column 4-6 and 7-9 show estimated coefficients for developed countries and developing countries respectively. For developed countries, the effect size ranges from 0.052 to 0.107, and for developing countries the effect ranges from

TABLE IX. THE ESTIMATED IMPACT OF ADVERTISING BAN ON CIGARETTE CONSUMPTION, 2001-2014

Variable	*All*			*Developed*			*Developing*		
	I	II	III	I	II	III	I	II	III
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ban	0.056	-0.001	-0.005	0.107	0.052	0.053	-0.012	-0.050	-0.071
	(0.057)	(0.053)	(0.051)	(0.075)	(0.060)	(0.056)	(0.080)	(0.077)	(0.073)
Price		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Years since First Ban		Yes	Yes		Yes	Yes		Yes	Yes
HHI			Yes			Yes			Yes
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.971	0.977	0.977	0.931	0.960	0.961	0.975	0.977	0.977

Notes: The dependent variable is log of consumption per capita. All models include country and year effects, as indicated above. Standard Errors are clustered by country. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

-0.012 to -0.071.

I next examine the effect of the level of restriction on consumption. Table X presents the estimates for limited and comprehensive restrictions. Similar to table 8, table 10 presents two alternative classifications. The results for both classifications are qualitatively similar. Column 4-6 show estimates for developed countries. Consistent with previous results, coefficients on indicator variables are positive for developed countries. Column 7-9 show estimates for developing countries. After controlling for confounding variables, the direction of the effect is negative for limited as well as comprehensive restrictions. Limited restrictions have smaller effect on consumption than comprehensive restrictions. However, these estimates are imprecisely estimated.

The effect of advertising restrictions on consumption differs from previous literature. In the most recent work on this topic, Blecher (2008) concludes that restrictions lead to a 23 percentage point fall in consumption per capita in developing countries. There are two major differences between Blecher's study and the present analysis. First, dataset in the paper is smaller and recent. An explanation for the difference in estimated effect may be diminishing returns to restrictions. As more restrictions are introduced and socio-economic context becomes more receptive to tobacco control, the effect of further restrictions becomes inconsequential. The second difference is the composition of countries, which possibly leading to different effect sizes. I plan to investigate these issues in future work.

TABLE X. THE ESTIMATED IMPACT OF ADVERTISING BAN ON CIGARETTE CONSUMPTION, 2001-2014: LEVEL OF RESTRICTION

Variable	*All*			*Developed*			*Developing*		
	I	II	III	I	II	III	I	II	III
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: *Weak=no ban, Limited=2 or 3 bans, Comprehensive=4 or more bans.*									
Limited	0.137**	0.048	0.044	0.160*	0.075	0.082	0.070	-0.003	-0.027
	(0.062)	(0.052)	(0.053)	(0.085)	(0.067)	(0.063)	(0.078)	(0.071)	(0.076)
Comprehensive	0.0194	-0.0218	-0.0250	0.0766	0.0383	0.0351	-0.0389	-0.0632	-0.0823
	(0.058)	(0.056)	(0.053)	(0.072)	(0.061)	(0.055)	(0.085)	(0.083)	(0.077)
Price		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Years since First Ban		Yes	Yes		Yes	Yes		Yes	Yes
HHI			Yes			Yes			Yes
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.972	0.978	0.978	0.933	0.960	0.962	0.976	0.977	0.977
Panel B: *Weak=no ban, Limited=tv & radio, or tv & radio plus billboards, Comprehensive=tv & radio, billboards and more bans.*									
Limited	0.146**	0.071	0.068	0.178**	0.099	0.092	0.075	-0.016	-0.046
	(0.071)	(0.057)	(0.057)	(0.085)	(0.069)	(0.069)	(0.108)	(0.115)	(0.120)
Comprehensive	0.0378	-0.016	-0.021	0.083	0.036	0.039	-0.022	-0.052	-0.072
	(0.057)	(0.054)	(0.052)	(0.073)	(0.060)	(0.056)	(0.081)	(0.078)	(0.073)
Price		Yes	Yes		Yes	Yes		Yes	Yes
Socio-Economic Characteristics		Yes	Yes		Yes	Yes		Yes	Yes
Years since First Ban		Yes	Yes		Yes	Yes		Yes	Yes
HHI			Yes			Yes			Yes
Country Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.972	0.978	0.978	0.933	0.960	0.962	0.975	0.977	0.977

Notes: The dependent variable is log of consumption per capita. All models include country and year effects, as indicated above. Standard Errors are clustered by country. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

1.8 Conclusion

By using the variation between countries in timing of adoption of advertising restrictions, this paper estimates the effect of an advertising ban on market-concentration, measured by Herfindhal-Hirschman Index (HHI). An advertising ban makes it more expensive for firms to reach their consumers and build up their goodwill. Smaller firms, who have low goodwill to start with, are disproportionately affected by the ban, which may lead to an increase in market-concentration. In addition, I examine whether the effect varies with the level of restrictions. Specifically, do comprehensive advertising restrictions have a stronger effect than limited advertising restrictions?

The evidence provides support for a positive relationship between advertising restrictions and market-concentration. The estimates of advertising ban on HHI in Section 6 A suggest that HHI increased by 0.058 points for countries that adopted the ban between 2001 and 2014, after removing mean country and common year effects, and conditional on trade and socio-economic characteristics. This estimate represents approximately 12.8 percent increase with respect to the sample mean (0.45). I identify a contrast between developed and developing countries. In developing countries, the comparable model estimates a coefficient of 0.081, representing an increase of 18 percent with respect to mean HHI of the whole sample (0.45), and about 16 percent increase with respect to mean HHI of developing countries (0.5). In developed countries, on the other hand, an advertising ban does not have an effect on concentration. This relationship holds even after controlling for region-specific trends, and excluding state-monopolies from the sample. In addition, I find that comprehensive restrictions have a stronger effect on concentration while limited restrictions have little or no effect.

Estimates of the effect of advertising restrictions on cigarette consumption are less conclusive. In Section 7, I find that consumption per capita falls after the adoption of bans in developing companies. However, the estimates lack statistical significance.

The findings revealed in this paper have important implications for policy. First, they provide a key piece of information regarding the effect of advertising restrictions on consumption—the indirect effect of restrictions through the degree of concentration in the market. Second, they present as an important trade-off for policymakers: on one hand, advertising restrictions are likely to reduce consumption of cigarettes; on the other hand, due to an increase in

market concentration, they may be giving more power to tobacco companies. Third, they inform the discussion on tobacco policy in developing countries. Despite a major change in policies, there still exists a large policy divide between developed and developing countries. Moreover, per capita rate of consumption in developed countries, though higher, is falling; but in developing countries the rate is rising and expected to rise even further in the future. This is particularly important because by 2030, eighty percent of tobacco related deaths may occur in developing countries.

Note that this analysis has focused solely on direct forms of advertising. Indirect forms of advertising, such as sponsorships, are also important channels through which firms reach their consumers. The question of interest is how important are these channels for market-concentration? Do they serve as substitutes or complements? Additionally, in studying the level of restriction, I have attempted to provide an overall sense of interaction between strength and concentration; however, the estimates are sensitive to different classifications. I can potentially combine the insights of literature on media-penetration to create a country-specific index weighted by the relative importance of a particular media. Finally, this paper concentrated on estimating whether a tobacco advertising ban has an effect on market-concentration, and the dynamics and strength of the ban. Another interesting question to study is whether the advertising ban changes the number of firms in the market, or affect domestic firms in favor of foreign firms. I plan to explore these questions and issues in future work.

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2 INDIRECT EFFECTS OF CONDITIONAL CASH TRANSFERS: EVIDENCE FROM PAKISTAN

2.1 Introduction

Large and persistent gaps in economic opportunities, access to health and education, and representation within households and societies exist worldwide. Across the world, women are less educated than men, are provided with fewer labor market opportunities, and are underrepresented in the government.

Many countries in the developing world have introduced conditional cash transfer programs to target gender disparities in health and education. Narrowing these disparities is important for development and policy making: "greater gender equality can enhance economic productivity, improve development outcomes for the next generation, and make institutions and policies more representative" (World Bank, 2012).

Policy makers assert that conditional cash transfers provide incentives for households to invest in the level of schooling. In societies where responsibility for schooling investments rests with parents, and children's contribution to household resources is not negligible, short-term parental interests may overshadow long-term interests of children. Even if parents recognize the importance of schooling investments for children, financial constraints and other family needs may not allow them to send their child to school. The idea of a conditional cash transfer is to provide financial incentives for households to change their behavior and increase schooling investments.

Economic analysis suggests that the effect of the program can be decomposed into textitincome effect and textitsubstitution effect. textitIncome effect will lead to an increase in educational investments as a result of cash transfer. textitSubstitution effect arises due to the conditionality of the transfer. It reduces the price of education and will lead to an increase in educational investment. Previous evidence suggests that conditional cash transfers have increased school enrollment among program beneficiaries, especially among those who had low initial level of enrollment. In Bangladesh, Cambodia, and Pakistan, the program led to an increase in enrollment of 12.0, 31.3 and 11.1 percentage points, respectively.

In this chapter, I study the impact of conditional cash transfer programs on educational

outcomes of ineligible children within the household. Ferreira, Filmer and Shardy (2009) argue that there may be negative impact on the outcomes of ineligible siblings of eligible children in the context where parents place different values on education for different children. More specifically, conditions placed on cash transfers for a child may provide incentive for parents to specialize in education of the eligible child, leading to less schooling for other children in the household.

I test the predictions of this model by studying a program introduced in the Punjab province of Pakistan, formally known as Female School Stipend Program (FSSP). The program offers monthly stipends to girls enrolled in secondary public school with an eighty percent attendance rate. I analyze the impact of having an eligible older sister on educational outcomes of younger siblings, separately for brothers and sisters.

The Program in Pakistan is well suited to study the predictions of this model for several reasons. First, there is clear evidence of discrimination in education in Pakistan. Previous research on determinants of school enrollment in primary school suggests that parents place different values on boys and girls education. Sathar and Lloyd (1994) find that "parents of rural girls are much more likely than parents of rural boys to cite lack of access or parental disapproval as reason for non-enrollment." Schooling costs have also been found to be more important factor for determining enrollment probability of girls than boys. Alderman and Chisti (1991) show that presence of girls of age ten to fourteen reduced mother's household labor time, while the presence of young boys of the same age increased it, implying that girls assist mothers in household chores.

Second, the variation in eligibility status allows for comparison between districts that received stipends and districts that do not receive stipends. Eligibility of the program, however, is not random and is based on literacy rate as of 1998 census. I attempt to control for the differences between stipend and non-stipend districts by adding controls that account for differential trends between treatment (stipend) and control (non-stipend) districts, and present results for a group that is not affected by the conditional cash transfer program.

I present evidence using a dataset derived by combining Household Integrated Economic Survey (2001-2002) and Household Integreted Economic Survey (2005-2006) which provides information on education and health outcomes, as well as, income and consumption expenditure at national and provincial level. Using a difference-in-difference approach, I find that the conditional cash transfer program has no effect on enrollment of younger ineligible cohorts of boys

and girls.

This study is related to Ferreira, Filmer and Shardy (2009) who present a model for effect of conditional cash transfers on ineligible siblings and provide evidence from Cambodia; to Berreira-Osorio et al (2008) and Khandker (2003) who show evidence of indirect effects on ineligible siblings; and to Hasan (2010) and Hasan (2010) who study the impact of the program on mothers time allocation and spillovers impacts on brothers school enrollment and school choice; and to Alam, Baez and Carpio (2011) who show long term effects of the present program on school completion, early labor market outcomes, marriage and fertility decisions of adolescent girls.

Existing evidence on the indirect effect of the program on younger siblings is thin. The main contribution of the paper is to bridge this gap by studying the effect of providing conditional cash transfers to girls enrolled in secondary school on educational investments of younger cohorts, separately for boys and girls.

2.2 Determinants of Schooling

Parents make decisions based on the perceived costs and returns of investments in children's schooling. These perceptions would strongly be influenced by the parent's socioeconomic condition and level of education. Higher educated parents place a greater value on education. Also, if parents have lower financial constrains, the costs of education are lower. In this section, I outline the costs and returns that determine the variation of school investments across households as well as within household. In other words, first, why do some parents some parents send their children to school? Second, why parents send some children to school and do not send others?

Kochar (2000a) shows that there is significant disconnect between parent's and child's rate of return to the child's education. Parents discount the future returns to child's education more than child. And since parents are making decisions, their returns are more likely to determine the amount of schooling the child receives. There may be differences within a household depending on which parent is responsible for making the decision. Some studies have shown that mothers value education more.

Parent's perception of returns may also depend on the expectation that children will contribute to household income in the future. Due to limited labor market opportunities for girls, especially in rural areas, the return to schooling is lower for girls than boys. Moreover,

traditionally, girls move to their husband s home after marriage which further lowers the perception of returns for parents.

Parents may have erroneous beliefs or lack of information, regarding returns to schooling decisions as well as how human capital is accumulated. For example, families may believe that effort in acquiring education is less important and children can start a business and earn higher income. Or they may believe that education requires natural abilities that their children do not possess. Or they may believe that boys are more talented than girls. These beliefs would result in different schooling investments.

Cost of schooling includes the monetary costs, such as tuition and supplies, as well as the opportunity cost of a child attending schools. In traditional or poor countries children's contribution to household resources is significant. Boys often contribute to family earnings by helping in the family business, or holding a job. And girls help with domestic chores and care of younger siblings. Time in school is time away from work. Baland and Robinson (2000) argue that child labor and underinvestment in schooling arise due to mismatch between parent‘s preferences and children‘s interests. Parents attribute a high opportunity cost to school investment and favor short run outcomes, that is, increased income from their child‘s labor, that carry more benefits for their selves rather than children.

As stated earlier, boys and girls have different duties within the household. Alderman and Chisti (1991), show that the presence of girls from ten to fourteen years of age reduced household labor time for mothers while presence of boys of the same age group increased it, implying that girls contribution to household work is non-negligible. Different household structure and needs will lead to differences in perceived costs for boys and girls.

Cultural practices and attitudes emphasizing girls' modesty and protection present another consideration for parents. Parents prefer for their daughters to acquire education in an all-girls school, staffed by female teachers, and at a close distance from their home. Every study of the determinants of primary school enrollment in Pakistan that has included data on primary school access to the community, in other words, presence of a gender specific school within the community or within reasonable distance from center of the community, has found access to be a significant factor in explaining enrollment across communities, particularly for girls (Sathar 2005, World Bank 2002, 2005).

Even if parents recognize the importance of schooling in their child's life, that is, the net return is positive, financial constraints coupled with other family needs, may not allow them to send the child to school. One such example is household fertility or the number of siblings. When the oldest child is younger, he or she does not have to compete with other siblings for household resources. As the family grows, however, as other siblings are born, the limited amount of resources are now shared among more children, and those with higher relative returns and lower relative costs receive more education.

2.3 Female School Stipend Program

Punjab female School Stipend program is a gender-targeted conditional cash transfer intended to increase educational attainment of girls and reduce gender inequalities in education. Under the program, girls in the eligible districts receive a monthly stipend of Rs. 200 (approx. 2 dollars) conditional on i) enrollment in classes 6 to 8 in secondary school, and ii) eighty percent attendance rate. District eligibility was based on literacy rate for the population aged 10 and over in the district according to 1998 national census. Fifteen districts with literacy rate below 40 percent were deemed eligible and the remaining 19 districts with literacy rate above 40 percent did not.

Program implementation officially began in 2004, with attendance compensation based on last quarter of 2003. During the first quarter, about 156, 000 girls received stipends (Hasan 2009). These stipends are meant to cover the cost of textbooks, uniform, stationery and transportation; and are transferred in quarterly payments directly to students' household via postal order.

2.4 Theory and Previous Evidence

A. Impact on Eligible Girls

Conditional cash transfers are conceptually similar to in-kind transfers. Households are given a cash transfer if they consume a pre-specified amount of the good. Theoretically, the effect of the program can be decomposed into income effect and substitution effect. Income effect will lead to an increase in educational investments as a result of cash transfer. Substitution effect arises due to the conditionality of the transfer. It reduces the price of education and will lead to an increase in educational investment. It is important to note that for those households that make

educational investment regardless of the program, income effect is the only relevant effect.

Previous studies show that Conditional Cash Transfers have led to increase in the educational outcomes of the 'receivers', especially among groups that had lower outcomes prior to program implementation. A few examples of programs introduced to address gender disparities are as follows. The Bangladesh Female Secondary Stipend Program increased enrollment of girls in 6 to 8th grade by 8 to 12 percentage points (Khandker et al., 2003); the Japan Fund for Poverty Reduction Scholarship Program in Cambodia increased school enrollment by 31.3 percentage points (Filmer and Shady, 2006); the program studied in this paper increased enrollment by 11.1 percentage points.

A list of Conditional Cash Transfer Programs aimed at increasing educational investments and the results along with empirical approaches, is given below.

- Chile, Chile Sollidario, Ages 6-15, RDD, Galasso (2006)
- Colombia, Familias en Accion, PSM,DD, Attanasio Fitzsimmons, and Gomez (2005)
- Ecuador, Bono de Desarrollo Humana, IV, Randomized, Schady and Araujo (2008)
- Hondurus, Programa de Asignacion Familia, Randomized, Glewwe and Olinto (2004)
- Jamaica, Program of Advancement through Health and Education, RDD, Levy and Ohls (2007)
- Mexico, Oportunidades, Randomized, Schultz (2004)
- Nicargua, Atencion a Crisis, Randomized, Macours and Vakis (2008)
- Nicargua, Red de Proteccion Social, Randomized, Maluccio and Flores (2005)
- Bangladesh, Female Secondary School Assitance Program, Ages 11-18, Girls, 12.0**, FE, Khandker, Pitt, and Fuwa (2003)
- Cambodia, Japan Fund for Poverty Reduction, Grades 7-9 (Girls) 31.3***, DD, Filmer and Schady (2008)
- Cambodia, Cambodia Education Sector Support Project, Grades 7-9,21.4***, RDD, Filmer and Schady (2009c)

- Pakistan, Punjab Education Sector Reform Program, Ages 10-14, 11.1***, DDD, Chaudhury and Parajuli (2008)
- Turkey, Social Risk Mitigation Project, Primary School,-3*, RDD, Ahmed et al. (2007)
- Turkey, Social Risk Mitigation Project, Secondary School,5.2, RDD, Ahmed et al. (2007)

B. Impact on Ineligible Girls

The argument for impact on ineligible siblings comes from theory on sibling complementarities. The theory suggests that in households termed as 'moderately poor', some children are made responsible for income generating work or household duties to enable their siblings to go to school. Emerson and Souza (2000a) show evidence of the relationship between birth order and propensity to go to school or work. Their results make two observations: i) the youngest brother is less likely to work than his older siblings, and ii) the eldest sister is less likely to go to school than her younger siblings.

As the evidence on effect of FSSF on enrolment is shown, older sisters are now going to school. This potentially has implications for educational investments of younger siblings. Basu (2003) suggest a link between birth order and gender in a way that older sister's labor "is used to enable younger male siblings to go to school". Enrollment of these girls into school can have negative effects on educational investments of male siblings. More over, the responsibility of work, domestic or outside, previously carried out by the eligible girls can fall on younger sisters and they make be taken out of school. On the other hand, younger sisters previously constrained by distance will now be able to go to school accompanied by their older sisters.

It is also important to note that there are possibly households that would invest in girls' education with or without the program. If daughters from these households are enrolled in secondary school, they will receive stipends, which will lead to a 'pure income effect' for the household. In this case, the educational investments on younger siblings will potentially increase.

Literature provides mixed evidence regarding spillover effects of FSSF. Hasan (2010) found that the enrollment of boys has increased. On the other hand, Alam et al (2011) found no spillover effects on enrollment of boys. The school choice decisions, however, seem to suggest that boys are now more likely to go to a private school. Evidence from other countries indicates that in

Colombia, the program increased the enrollment of recipients, ineligible siblings were more likely to drop out of school and enter the labor market ((Barrera-Osorio et al. 2008); in Cambodia that targeted poor children making the transition from primary to lower secondary school shows that the school enrollment of ineligible siblings was not affected by the program (Ferreira et al. 2009).

Thus, evidence on the indirect effect of the program on younger siblings is thin. This paper aims to bridge this gap by studying the effect of providing conditional cash transfers to girls enrolled in secondary school on educational investments of younger cohorts, separately for boys and girls.

2.5 Data and Identification Strategy

A. Data Description

The dataset used in this paper is derived from combining two waves of Household Integrated Economic Surveys (HIES): 2001-02 and 2005-06, conducted in Pakistan. HIES provides information on a range of economic and social variables.

I restricted the dataset to contain households that meet the following two conditions: i) Live in the Province of Punjab; and ii) At least one member between the age 0 to eighteen. The combined data consists of 9, 507 households. Summary Statistics on basic characteristics of households are provided in Table XI. They are calculated by stratum: in rural region, a district represents a strata, while in the urban region, an administrative unit represents a strata. As average household characteristics may differ by region, Table XII and XIII show the urban/rural breakdown. There are 3, 848 households living in the urban region, and 5, 659 households living in the rural region.

Households in the sample are composed of, on average, seven people, with three above the age of eighteen, and four under the age of eighteen. There are two children between the ages of six and ten, and one between the ages of eleven and fourteen. In terms of regional breakdown, urban households have one less child between the ages of six and ten. Average annual household income in the sample is Rs. 94, 537- urban households have considerably higher income of Rs. 111, 016 as compared to rural households whose average income is Rs. 60, 464. Average age of a head is forty six years. In terms of education, heads in rural areas are less educated as compared

to urban areas.

The survey data contain a number of demographic details on parents. I defined an individual in the household to be a father/mother if he/she has a child of age 0 to 18. Summary Statistics for parents are in Panel B. An average father in the sample is forty six years old with five years of education. An average mother is forty one years old with two years of schooling. Around forty percent of fathers and seventy percent of mothers have never attended schools. Over eighty-five percent of fathers are employed, of whom around twenty percent are self-employment. On the other hand, only twenty four percent of mothers are employed.

In addition, there are significant differences between parents in urban and rural areas. An average father in an urban region, though same in age, has attained seven years of schooling, while an average father in rural areas has only completed four. Twenty seven percent fathers in urban areas have never attended school, while a much higher percent of fifty one have never attended school in rural areas. Although the fraction of fathers employed is the same in the both region, urban fathers are more likely to be self-employed than rural fathers: thirty percent of urban fathers in the sample are self-employed and sixteen percent of rural fathers are self-employed. In terms of mothers, the picture is the same except for employment. Rural mothers are more likely to be employed than urban mothers. These numbers show support for the opinion that mothers from poor households are more likely to be employed to support the family.

Panel C reports summary statistics on education measures for children under the age of eighteen in the sample. The panel reports enrollment measure for three age groups: six to ten, eleven to fourteen, and fifteen to seventeen, separately for boys and girls. Overall, boys of all age groups are more likely to be enrolled in a school. Average enrollment for boys of age six to ten is seventy-eight percent, while average enrollment of girls is seventy-one percent. Percent of children enrolled decreases as age increases. Boys enrollment for age eleven to fourteen is slightly lower than younger group and decreases to fifty percent for age fifteen to seventeen. Girls enrollment follows similar pattern, however, the fall in enrollment is higher than boys: forty percent for ages fifteen to seventeen. Urban/Rural breakdown shows that overall enrollment is lower for all age groups in rural region. Further, girls enrollment is considerably lower in rural region.

In terms of access to school, fourteen percent of households have access to a government school, and eight percent have access to a private school, within 2 km from their home. As

expected, access to private schools is higher in urban areas than in rural areas. Thirteen percent of households in urban areas have access to a private school within 2 km, while only five percent of households in the sample have access to a private school within 2 km in rural areas.

I redefined the occupation categories to include five categories: Legislators or Senior Official or Manager, Skilled Agriculture and Fishery, Professionals, Technicians or Clerks, and Elementary Occupations. Highest percentage of employment in the sample is in elementary occupations, skilled agriculture and fisher and technicians/clerk group, respectively. This pattern, however, is different for urban and rural regions. Urban individuals are more likely to employed in elementary occupations, forty seven percent in the sample, or as technicians, thirty nine percent in the sample. Whereas almost fifty percent of individuals in the sample are employed in skilled agriculture and fishery sector, followed by elementary occupations at thirty six percent.

Data on asset ownership and access to utilities is based on information collected at household level. Panel E provides information on land ownership and utilities. Eighty six percent of household in the sample own residential land, and ten percent own agricultural land. Perhaps surprisingly, the pattern in the sample is similar for rural and urban region, however, households in rural areas are slightly more likely to own land than households in urban areas. Percentage of agricultural owners is around seven percent in urban region and thirteen percent in rural region. Similarly, percentage of residential land owners is slightly higher for rural region at eighty nine percent, as compared to eighty percent of urban residential land owners.

TABLE XI. SUMMARY STATISTICS, FULL SAMPLE

Variable	Obs	Mean	Std. Dev.
Panel A: Household Characteristics			
Number of People in Household (#)	9507	7.34	2.96
Number of Children under the age of 18 in Household (#)	9507	3.91	2.01
Number of Children under the age of 5 in Household (#)	9507	.91	1.07
Number of Children of Primary School Age in Household (#)	9507	1.53	1.2
Number of Children of Secondary School Age in Household (#)	9507	1.32	1.12
Number of Adults in Household (#)	9507	3.44	1.88
Annual Income (Rs)	8935	86105.95	127772.3
Head's Age	9503	45.91	12.59
Head's Highest Class Completed	9500	4.53	5.03
Head is Female (=1)	9507	.1	.3
Panel B: Parents' Characteristics			
Father's Age	10360	45.65	13.99
Father's Highest Class Completed	10350	4.81	5.04
Father Never Attended School	10361	.41	.49
Father is Employed	10361	.87	.34
Father is Self Employed	10361	.22	.41
Mother's Age	12373	41.03	13.89
Mother's Highest Class Completed	12370	2.28	4.02
Mother Never Attended School	12375	.71	.45
Mother is Employed	12375	.24	.43
Mother is Self Employed	12375	.02	.13
Panel C: School Access and Enrolment			
Access to Primary School (Boys)	7408	.62	.48
Access to Secondary School (Boys)	6280	.48	.5
Access to Primary School (Girls)	7100	.59	.49
Access to Secondary School (Girls)	6310	.42	.49
Boys Currently Enrolled: Age 6-10	6171	.78	.41
Boys Currently Enrolled: Age 11-14	4312	.72	.45
Boys Currently Enrolled: Age 15-17	2680	.51	.5
Girls Currently Enrolled: Age 6-10	5969	.71	.45
Girls Currently Enrolled: Age 11-14	4188	.61	.49
Girls Currently Enrolled: Age 15-17	2859	.4	.49
Panel D: Main Occupation			
Legislator/Senior Official/Manager	19526	.01	.11
Skilled Agriculture and Fishery	19526	.33	.47
Professionals	19526	.03	.18
Technicians/Clerks etc	19526	.23	.42
Elementary Occupations	19526	.4	.49
Panel E: Asset Ownership and Access to Utilities			
Any HH member own Residential Land?	9252	.85	.36
Any HH member own Commerical Land?	9252	.04	.19
Any HH member own Nonagricultural Land?	9252	.03	.16
Any HH member own Agricultural Land?	9256	.09	.29
Have Electricity Connection	9507	.86	.34
Have Gas Connection	9507	.28	.45
Have Telephone Connection	9507	.2	.4

Note: This table shows summary statistics for Household Integrated Economic Survey, Pakistan, 01-02 and 05-06, Statistics are calculated at stratum level. In rural region, a district is considered a stratum. In the urban region, an administrative unit is considered a stratum.

TABLE XII. SUMMARY STATISTICS, URBAN REGION

Variable	Obs	Mean	Std. Dev.
Panel A: Household Characteristics			
Number of People in Household (#)	3848	7.32	2.94
Number of Children under the age of 18 in Household (#)	3848	3.76	1.94
Number of Children under the age of 5 in Household (#)	3848	.81	1.05
Number of Children of Primary School Age in Household (#)	3848	1.37	1.15
Number of Children of Secondary School Age in Household (#)	3848	1.4	1.13
Number of Adults in Household (#)	3848	3.57	1.95
Annual Income (Rs)	3848	111016.6	157917
Head's Age	3847	45.44	11.57
Head's Highest Class Completed	3846	6.47	5.5
Head is Female (=1)	3848	.02	.06
Panel B: Parents' Characteristics			
Father's Age	4223	45.07	13.05
Father's Highest Class Completed	4219	6.71	5.44
Father Never Attended School	4223	.27	.45
Father is Employed	4223	.86	.35
Father is Self Employed	4223	.3	.46
Mother's Age	4968	40.75	13.13
Mother's Highest Class Completed	4965	4.04	4.92
Mother Never Attended School	4968	.53	.5
Mother is Employed	4968	.15	.36
Mother is Self Employed	4968	.02	.15
Panel C: School Access and Enrolment			
Access to Primary School (Boys)	2654	.7	.46
Access to Secondary School (Boys)	2683	.55	.5
Access to Primary School (Girls)	2615	.7	.46
Access to Secondary School (Girls)	2705	.55	.5
Boys Currently Enrolled: Age 6-10	2218	.85	.36
Boys Currently Enrolled: Age 11-14	1797	.75	.43
Boys Currently Enrolled: Age 15-17	1211	.56	.5
Girls Currently Enrolled: Age 6-10	2244	.85	.36
Girls Currently Enrolled: Age 11-14	1793	.77	.42
Girls Currently Enrolled: Age 15-17	1287	.56	.5
Panel D: Main Occupation			
Legislator/Senior Official/Manager	7149	.02	.15
Skilled Agriculture and Fishery	7149	.06	.24
Professionals	7149	.06	.24
Technicians/Clerks etc	7149	.39	.49
Elementary Occupations	7149	.47	.5
Panel E: Asset Ownership and Access to Utilities			
Any HH member own Residential Land?	3658	.79	.41
Any HH member own Commerical Land?	3068	.07	.25
Any HH member own Nonagricultural Land?	3184	.03	.18
Any HH member own Agricultural Land?	3197	.07	.26
Have Electricity Connection	3848	.97	.18
Have Gas Connection	3848	.61	.49
Have Telephone Connection	3848	.34	.47

Note: This table shows summary statistics for Household Integrated Economic Survey, Pakistan, 01-02 and 05-06, Statistics are calculated at stratum level. In rural region, a district is considered a stratum. In the urban region, an administrative unit is considered a stratum.

TABLE XIII. SUMMARY STATISTICS, RURAL REGION

Variable	Obs	Mean	Std. Dev.
Panel A: Household Characteristics			
Number of People in Household (#)	5659	7.36	2.97
Number of Children under the age of 18 in Household (#)	5659	4.01	2.06
Number of Children under the age of 5 in Household (#)	5659	.97	1.09
Number of Children of Primary School Age in Household (#)	5659	1.63	1.22
Number of Children of Secondary School Age in Household (#)	5659	1.27	1.1
Number of Adults in Household (#)	5659	3.35	1.83
Annual Income (Rs)	5659	60463.85	92155.21
Head's Age	5656	46.22	13.22
Head's Highest Class Completed	5654	3.2	4.19
Head is Female (=1)	5659	.02	.07
Panel B: Parents' Characteristics			
Father's Age	6137	46.04	14.59
Father's Highest Class Completed	6131	3.5	4.29
Father Never Attended School	6138	.51	.5
Father is Employed	6138	.87	.33
Father is Self Employed	6138	.16	.37
Mother's Age	7405	41.22	14.38
Mother's Highest Class Completed	7404	1.1	2.69
Mother Never Attended School	7407	.83	.38
Mother is Employed	7407	.3	.46
Mother is Self Employed	7407	.01	.12
Panel C: School Access and Enrolment			
Access to Primary School (Boys)	4754	.58	.49
Access to Secondary School (Boys)	3597	.42	.49
Access to Primary School (Girls)	4485	.52	.5
Access to Secondary School (Girls)	3605	.33	.47
Boys Currently Enrolled: Age 6-10	3953	.74	.44
Boys Currently Enrolled: Age 11-14	2515	.7	.46
Boys Currently Enrolled: Age 15-17	1469	.47	.5
Girls Currently Enrolled: Age 6-10	3725	.63	.48
Girls Currently Enrolled: Age 11-14	2395	.5	.5
Girls Currently Enrolled: Age 15-17	1572	.26	.44
Panel D: Main Occupation			
Legislator/Senior Official/Manager	12377	0	.06
Skilled Agriculture and Fishery	12377	.49	.5
Professionals	12377	.02	.13
Technicians/Clerks etc	12377	.13	.34
Elementary Occupations	12377	.36	.48
Panel E: Asset Ownership and Access to Utilities			
Any HH member own Residential Land?	5561	.89	.31
Any HH member own Commerical Land?	4626	.03	.17
Any HH member own Nonagricultural Land?	4828	.03	.16
Any HH member own Agricultural Land?	4858	.13	.34
Have Electricity Connection	5659	.79	.41
Have Gas Connection	5659	.05	.22
Have Telephone Connection	5659	.1	.31

Note: This table shows summary statistics for Household Integrated Economic Survey, Pakistan, 01-02 and 05-06, Statistics are calculated at stratum level. In rural region, a district is considered a stratum. In the urban region, an administrative unit is considered a stratum.

B. Identification Strategy

The identification strategy in this paper is to compare changes in educational outcomes for households living in districts that were offered the stipend program to districts that were not offered. Formerly, I use difference-in-difference approach to study educational outcomes for younger ineligible children living in stipend districts and non-stipend districts, separately for boys and girls. Denote the outcome for individual i in district d in year t as s_{idt}; the indicator for program district as $stipend_d$; and the indicator for post program as $after_t$. The basic regression to be estimated is

$$s_{idt} = \alpha + \gamma stipend_d + \delta after_t + \beta stipend \times after_{dt} + \epsilon_{idt} \tag{7}$$

where α is the average outcome before the program in non program districts; δ captures changes in outcome for all households before and after the program; γ measures the location effect which is not due to the introduction of the program. The coefficient of interest is β which measures the changes in outcome due to introduction of the program. The coefficient is identified under the assumption that districts that were offered the program would not have otherwise changed differently than the districts that were not offered the program. More formally, in the absence of the program, the change in educational outcomes of younger ineligible children would not have been systematically different in stipend and non-stipend districts.

The educational outcome studied in the primary analysis is an indicator for whether the child is currently enrolled in school or not. This allows me to interpret the results as change in enrollment probability. An apparent concern for identification is participation bias, that is, households that decide to enroll their daughters in secondary public schools may be different from households who have daughters of the relevant age but choose not to enroll them in school, or choose not to enroll in public school. For this reason, instead of using enrollment in classes 6-8 (secondary school) or classes 1-5 (Primary school) to classify cohorts, I use age based classification. Girls older than age 10 are classified as eligible for the program and children between the ages of 5 to 9 are classified as ineligible for the program. The results are interpreted as intent-to-treat effect of the program, that is, changes in enrollment probabilities of younger siblings of all eligible girls, whether or not they participated in the program.

There are two obvious concerns when identifying the effects in this paper based on variation in program implementation. The first concern is that the program was targeted at districts based on existing conditions. The second concern is that there could be selective migration from districts that were not offered the stipends to districts that were offered stipends by households who have the most need for them. In the context of this program, however, the latter is less likely to be an issue. At the time of initial introduction, there was no indication that the program will be extended to later years. So it is unlikely that households will choose to migrate based on the program. The former, however, is a major concern as the program was targeted at low-literacy districts: stipend districts are likely to be different from non-stipend districts. Table XIV and XV explores the differences in household characteristics between non-stipend and stipend districts.

In the sample, there are 2,992 households living stipend districts and 6, 515 households living in non-stipend restricts. Households in stipend district have more dependents, are relatively poorer, and are headed by individuals with 2 years less education. They are composed of 1 more person, eight on average, compared to non-stipend district. They also have one more child under the age of ten. Average annual income is Rs. 60,511 , which is significantly lower than average annual income of Rs. 90, 300 in non-stipend districts. Average schooling of household head is three years in stipend districts and five years in non-stipend districts.

Parents in stipend districts are more likely to have never attended school. Fifty-six percent of fathers living in stipend districts in the sample have never attend school compared to thirty-four percent in the non-stipend districts. Percentages for mothers are even higher. Eighty-four percent of mothers in the sample living in stipend districts have never attended school compared to sixty-three percent mothers in non-stipend districts. For those parents who have attended school, average schooling completed is lower than parents living in non-stipend districts. Fathers have, on average, three years less schooling in stipend districts than fathers in non-stipend districts whose average schooling is six years. Mothers in stipend districts have one year of school, on average, compared to mothers in non-stipend district who have an average of three years of schooling. As expected due to their financial status, mothers in stipend districts are more likely to be employed . Thirty-eight percent mothers living in stipend districts are more employed, while almost half of that in non-stipend districts are employed.

There are also significant differences in school access and enrollment between stipend and

non-stipend districts. These differences are more apparent for girls than boys. Here, I refer to 'access' as having a school within 2 kim distance to their home. In non-stipend districts, access to primary and secondary school is similar for both boys and girls. In stipend districts overall access is lower for both boys and girls. Forty-nine percent of boys live within 2 km of a primary school and thirty six percent boys live within 2 km of a secondary school. And thirty nine percent girls live within 2 km of a primary school and only twenty three percent girls live within 2 km of a secondary school.

School enrollment follows a similar pattern. Non-stipend districts have higher enrollment for all three age groups: 6-10 years, 11-14 years, and 15-17 years. And enrollment for girls is only slightly lower than boys. On the other hand, stipend districts have lower than average percent of boys enrolled at each age group, which decrease as age increase: age five to ten is sixty-six percent ; age six to fourteen is sixty-three percent; and age fifteen to seventeen is forty-two percent. Enrollment statistics for girls are even lower: age five to ten is fifty-one percent ; age six to fourteen is thirty nine percent; and age fifteen to seventeen is only twenty two percent.

In terms of occupational differences, individuals living in stipend districts are most likely to be employed in Skilled Agricultural and Fishery Sector (forty eight percent are employed in the sample). Individuals in non-stipend districts are most likely to be employed in Elementary Occupations (forty two percent in the sample). Land ownership is similar between the two groups. Above eighty percent of households own residential land in stipend and non-stipend districts. Agricultural land ownership is slightly higher for stipend districts (thirteen percent) than non-stipend districts (ten percent). By contrast, access to utilities is significantly lower for stipend districts. In the sample, only eight percent of households living in stipend districts have a gas connection compared to thirty seven percent households in non-stipend districts. Ten percent of households living in stipend districts have a telephone connection compared to twenty four percent living in non-stipend districts. Most households in the sample have electricity connection, ninety-four percent in non-stipend districts and sixty-nine percent in stipend districts.

It is most likely that these conditions contribute to lower enrollment in these districts and are associated with program introduction. The difference-in-difference framework in this context will fail to capture the true impact, potentially understating the effects of the program. Given this concern, I will include controls for three sets of characteristics that affect enrollment patterns.

First, household attributes that include number of people in the household, number of children under the age of 5, household income, whether household owns agricultural land, and parents' age, education, schooling and employment separately for mother's and father's. Second baseline enrollment and presence of a private and public schools within 2 km. Third, the general welfare of the district by controlling for access to utilities such as electricity, telephone and gas. The regression to be estimated is

$$s_{idt} = \alpha + \gamma stipend_d + \delta after_t + \beta stipend \times after_{dt} + \tau X_{idt} + \epsilon_{idt} \tag{8}$$

Then, the difference-in-difference estimate, β captures the intent-to-treat effect, identified under the assumption that after controlling for the above mentioned variables stipends and non-stipends districts would not have changed differently. For each group, I present results for equation (1) and (2).

TABLE XIV. SUMMARY STATISTICS, NON-STIPEND DISTRICTS

Variable	Obs	Mean	Std. Dev.
Panel A: Household Characteristics			
Number of People in Household (#)	6515	7.28	2.89
Number of Children under the age of 18 in Household (#)	6515	3.79	1.92
Number of Children under the age of 5 in Household (#)	6515	.83	1.04
Number of Children of Primary School Age in Household (#)	6515	1.43	1.16
Number of Children of Secondary School Age in Household (#)	6515	1.36	1.1
Number of Adults in Household (#)	6515	3.49	1.93
Annual Income (Rs)	6515	90300.47	139141.5
Head's Age	6514	46.35	12.44
Head's Highest Class Completed	6511	5.27	5.19
Head is Female (=1)	6515	.02	.07
Panel B: Parents' Characteristics			
Father's Age	7027	45.97	13.8
Father's Highest Class Completed	7020	5.67	5.18
Father Never Attended School	7027	.34	.48
Father is Employed	7027	.86	.35
Father is Self Employed	7027	.23	.42
Mother's Age	8463	41.21	13.73
Mother's Highest Class Completed	8459	2.94	4.38
Mother Never Attended School	8464	.63	.48
Mother is Employed	8464	.18	.38
Mother is Self Employed	8464	.02	.13
Panel C: School Access and Enrolment			
Access to Primary School (Boys)	4756	.7	.46
Access to Secondary School (Boys)	4416	.52	.5
Access to Primary School (Girls)	4576	.69	.46
Access to Secondary School (Girls)	4416	.51	.5
Boys Currently Enrolled: Age 6-10	3979	.84	.36
Boys Currently Enrolled: Age 11-14	3002	.76	.43
Boys Currently Enrolled: Age 15-17	1943	.55	.5
Girls Currently Enrolled: Age 6-10	3860	.83	.38
Girls Currently Enrolled: Age 11-14	2924	.71	.45
Girls Currently Enrolled: Age 15-17	2035	.47	.5
Panel D: Main Occupation			
Legislator/Senior Official/Manager	12238	.02	.13
Skilled Agriculture and Fishery	12238	.24	.43
Professionals	12238	.04	.2
Technicians/Clerks etc	12238	.28	.45
Elementary Occupations	12238	.42	.49
Panel E: Asset Ownership and Access to Utilities			
Any HH member own Residential Land?	6285	.87	.33
Any HH member own Commerical Land?	5230	.05	.21
Any HH member own Nonagricultural Land?	5488	.03	.18
Any HH member own Agricultural Land?	5515	.1	.3
Have Electricity Connection	6515	.94	.23
Have Gas Connection	6515	.37	.48
Have Telephone Connection	6515	.24	.43

Note: This table shows summary statistics for non-stipend districts (control group). Districts whose literacy rate was below 40 percent as of 1998 census received stipends. Statistics are calculated at stratum level (District in rural region; Administrative Unit in Urban Region).

TABLE XV. SUMMARY STATISTICS, STIPEND DISTRICTS

Variable	Obs	Mean	Std. Dev.
Panel A: Household Characteristics			
Number of People in Household (#)	2992	7.48	3.09
Number of Children under the age of 18 in Household (#)	2992	4.17	2.18
Number of Children under the age of 5 in Household (#)	2992	1.06	1.12
Number of Children of Primary School Age in Household (#)	2992	1.73	1.25
Number of Children of Secondary School Age in Household (#)	2992	1.26	1.14
Number of Adults in Household (#)	2992	3.31	1.78
Annual Income (Rs)	2992	60511.07	85582.66
Head's Age	2989	44.94	12.84
Head's Highest Class Completed	2989	2.91	4.25
Head is Female (=1)	2992	.02	.06
Panel B: Parents' Characteristics			
Father's Age	3333	44.97	14.36
Father's Highest Class Completed	3330	3	4.2
Father Never Attended School	3334	.56	.5
Father is Employed	3334	.88	.32
Father is Self Employed	3334	.18	.39
Mother's Age	3910	40.64	14.23
Mother's Highest Class Completed	3910	.84	2.54
Mother Never Attended School	3911	.87	.33
Mother is Employed	3911	.38	.48
Mother is Self Employed	3911	.02	.13
Panel C: School Access and Enrolment			
Access to Primary School (Boys)	2652	.49	.5
Access to Secondary School (Boys)	1864	.36	.48
Access to Primary School (Girls)	2524	.39	.49
Access to Secondary School (Girls)	1894	.23	.42
Boys Currently Enrolled: Age 6-10	2192	.66	.47
Boys Currently Enrolled: Age 11-14	1310	.63	.48
Boys Currently Enrolled: Age 15-17	737	.42	.49
Girls Currently Enrolled: Age 6-10	2109	.51	.5
Girls Currently Enrolled: Age 11-14	1264	.39	.49
Girls Currently Enrolled: Age 15-17	824	.22	.42
Panel D: Main Occupation			
Legislator/Senior Official/Manager	7288	0	.04
Skilled Agriculture and Fishery	7288	.48	.5
Professionals	7288	.02	.12
Technicians/Clerks etc	7288	.14	.35
Elementary Occupations	7288	.36	.48
Panel E: Asset Ownership and Access to Utilities			
Any HH member own Residential Land?	2934	.8	.4
Any HH member own Commerical Land?	2464	.04	.2
Any HH member own Nonagricultural Land?	2524	.02	.15
Any HH member own Agricultural Land?	2540	.13	.34
Have Electricity Connection	2992	.69	.46
Have Gas Connection	2992	.08	.26
Have Telephone Connection	2992	.1	.31

Note: This table shows summary statistics for stipend districts (treatmet group). Districts whose literacy rate was below 40 percent as of 1998 census received stipends. Statistics are calculated at stratum level (District in rural region; Administrative Unit in Urban Region).

2.6 Results

The central question in this section is if the stipend offered to older sisters has an impact on educational outcomes of younger siblings. Before estimating the effect of the program on ineligible younger siblings, however, it is worth exploring the effect of the program on eligible group in this sample. Whether providing conditional transfers to girls enrolled in secondary school will increase the enrollment is hard to determine theoretically, which is important as a 'first stage'. Section 6.1 presents results for the effect of *Female Secondary School Stipend Program* on the eligible girls.

A. Effect on Enrollment of Eligible Children

Table XV summarizes the levels and changes in mean enrollment for treatment and control groups before and after Female Secondary Education Stipend Program. Panel A shows enrollment for girls between the age 10 and 14. As there is a possibility that the program may motivate older girls to go back to school, Panel B includes older girls, showing enrollment for girls between the age 10 and 17. In each panel, the first column corresponds to the mean prior to implementation of the program, that is, in 2001; the second column corresponds to the mean after implementation of the program, that is, in 2005; and the third column to change in enrollment. The difference in difference estimate of the effect of the program is the last column.

Enrollment in both types of groups in Panel A increased over time. The increase was higher in the group that was eligible for stipends. Mean enrollment in the treatment group in Panel A increased by 16.87 percentage points: from 32.51 percent to 49.38 percent. Mean enrollment of the control group increased by 6.4 percentage points: from 70.97 to 77.47 percent. The change in the control group suggests that there is an aggregate effect in enrollment. The estimate of the effect of the program, in this simple comparison is 10.4 percentage points. Panel B presents similar results. Mean enrollment increased by 13.51 percentage points (from 26.82 percent to 42.46 percent) in the treatment group and 5.6 percentage points (from 61.67 percent to 67.28 percent) in the control groups. The estimate of the effect of the program is 10 percentage points.

The above comparison shows that FESSF had an effect of increasing enrollment by approximately 10 percentage points. This estimate is interpreted as the causal effect of the

program under the assumption that in the absence of the program, increase in enrollment in treatment and control groups would not have been systematically different. Because the program placement is not random, and households living in stipend and non-stipend districts differ in demographic characteristics, the observed increase in enrollment may reflect underlying differences between the treatment and control groups rather than a treatment effect. To the extent that non-random placement reflects characteristics that are fixed over time, such differences will be adjusted for. On the other hand, if composition of treatment and control groups changes over time, or some demographic characteristics are correlated with dependent variable, the identification assumption will be violated.

Table XVI present results in a regression context. Column (1) and (2) present results for girls between the age 10 and 14. Column (3) and Column (4) include older girls to present results for girls between the ages 10 and 17. The empirical models estimated for each group are:

$$s_{idt} = \alpha + \gamma stipend_d + \delta after_t + \beta stipend \times after_{dt} + \epsilon_{idt} \tag{9}$$

$$s_{idt} = \alpha + \gamma stipend_d + \delta after_t + \beta stipend \times after_{dt} + \tau X_{idt} + \epsilon_{idt} \tag{10}$$

where α is the average outcome before the program in non-program districts; δ captures changes in outcome for all households before and after the program; γ measures the location effect which is not due to the introduction of the program. The coefficient of interest is β which measures the changes in outcome due to introduction of the program. A test of the effect of FESSF is a test that eligible girls increased their enrollment in stipend districts after the program was implemented relative to girls of the same age living in non-stipend districts. It is a test that β is greater than zero.

Column (1) and (3) of Table XVI are directly comparable to simple difference-in-difference of enrollment in column (3) of Table XV. Column (2) and (4) present estimates after controlling for household, demographic and community level characteristics.

The estimated coefficient on post program dummy becomes small in magnitude and loses statistical significance: from 0.065 and 0.021 suggesting that there is no overall time trend in enrollment for the two groups additional controls are included in the regression. The coefficient on stipend changes dramatically once controls are included: from -0.385 to -0.067 for girls

between the age of 10 and 14. This is not surprising as households living in stipend and non-stipend districts have different characteristics. What would be concerning is if there is a substantial change in the treatment effect, that is the interaction term, after controls are included. A substantial change will suggest that any changes in demographic composition of the two groups over time are correlated with the treatment. Coefficient on the interaction term decreases slightly: from 0.104 to 0.074 (with a standard error of 0.041) for girls between the age 10 and 14. The estimate implies that FESSF led to an increase in enrollment probability of an eligible girl, between the age 10 and 14, by 7.4 percentage points. Compared to the mean, this is an increase of 11 percentage points.

Point estimates for girls between the ages 10 and 17 are very similar. The coefficient on time dummy becomes small and loses significance: from 0.056 to 0.015; coefficient on stipend changes dramatically: from -.349 to -0.042; and the interaction term decreases slightly: from 0.100 to 0.066 (with a standard error of 0.032). Similar to the previous group, the estimates imply that FESSF led to an increase in enrollment probability of an eligible girl between the age 10 and 17, by 6.6 percentage points. Compared to the mean, this is an increase of 11 percentage point.

The coefficients on other demographic characteristics all have expected signs. Girls from richer households have a higher probability of being enrolled. Mothers education increases the probability of daughter being enrolled. On the other hand, girls whose mother is employed have a lower probability. And finally, having more children under the age of 5 in the household reduces the probability of being enrolled.

I also estimated the models using smaller bandwidths (Table XVII). Additionally, I used regression discontinuity design (Table XVIII& XIX) to estimate the effect of the program on eligible girls. All models yield similar results.

TABLE XVI. EFFECT ON ENROLLMENT OF ELIGIBLE GIRLS

	Age: 10-14	Age: 10-14	Age: 10-17	Age: 10-17
Stipend x Post Treatment	0.104**	0.074*	0.100**	0.066**
	(0.047)	(0.041)	(0.039)	(0.032)
Post Treatment	0.065***	0.021	0.056***	0.015
	(0.019)	(0.018)	(0.017)	(0.015)
Stipend	-0.385***	-0.067**	-0.349***	-0.042*
	(0.046)	(0.031)	(0.041)	(0.024)
Controls	No	Yes	No	Yes
N	5423	3727	8282	5559
R^2	.111	.36	.0826	.33

Notes:
1) The dependent variable is an indicator for whether the girl is currently enrolled in school. Mean enrolment is 64.3 percent for girls aged 10-14 and 55.7 percent for girls aged 10-17.
(2) Mean enrolment for stipend districts is 41.6 percent for age-group 10-14 and 35.2 percent in age group 10-17. Mean enrolment for non-stipend districts is 74.2 percent for age group 10-14 and 64.5 percent in age-group 10-17.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XVII. EFFECT ON ENROLLMENT OF ELIGIBLE GIRLS, SHORTER BANDWIDTH

	Age: 10-14			Age: 10-17		
	BW=10	BW=15	BW=20	BW=10	BW=15	BW=20
Stipend x Post Treatment	-0.021	0.042	0.064	0.025	0.056	0.067**
	(0.049)	(0.045)	(0.043)	(0.037)	(0.034)	(0.032)
Post Treatment	0.091***	0.051*	0.029	0.038*	0.023	0.010
	(0.029)	(0.026)	(0.021)	(0.021)	(0.021)	(0.017)
Stipend	-0.015	-0.049	-0.063*	-0.020	-0.037	-0.047*
	(0.035)	(0.033)	(0.032)	(0.026)	(0.023)	(0.024)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1940	2507	2953	2875	3716	4373
R^2	.34	.341	.355	.312	.311	.32

Notes:
1) The dependent variable is an indicator for whether the girl is currently enrolled in school. MeanMean enrolment is 64.3 percent for girls aged 10-14 and 55.7 percent for girls aged 10-17.
(2) Bandwidth is calculated based on literacy rate as per 1998 census. For example, bandwidth of 10 includes districts with literacy rate of 10 percentage points above and and below the cutoff point of 40 percent, as of 1998.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XVIII. EFFECT ON ENROLLMENT OF ELIGIBLE GIRLS, RDD

	Age: 10-14	Age: 10-14	Age: 10-17	Age: 10-17
Stipend x Post Treatment	0.086*	0.068	0.082**	0.060*
	(0.048)	(0.041)	(0.040)	(0.032)
Post Treatment	0.083***	0.027	0.075***	0.020
	(0.021)	(0.018)	(0.018)	(0.015)
Stipend	-0.208***	-0.052	-0.167***	-0.026
	(0.058)	(0.032)	(0.053)	(0.023)
Cut off-Lit rate	0.008***	0.001	0.008***	0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Controls	No	Yes	No	Yes
N	5221	3593	7975	5360
Adj.R squared	.125	.358	.0972	.327

Notes:
1) The dependent variable is an indicator for whether the girl is currently enrolled in school. Mean enrolment is 64.3 percent for girls aged 10-14 and 55.7 percent for girls aged 10-17.
(2) Mean enrolment for stipend districts is 41.6 percent for age-group 10-14 and 35.2 percent in age group 10-17. Mean enrolment for non-stipend districts is 74.2 percent for age group 10-14 and 64.5 percent in age-group 10-17.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XIX. EFFECT ON ENROLLMENT OF ELIGIBLE GIRLS, RDD, SHORTER BANDWIDTH

	Age: 10-14			Age: 10-17		
	BW=10	BW=15	BW=20	BW=10	BW=15	BW=20
Stipend x Post Treatment	-0.022	0.039	0.064	0.025	0.055	0.067**
	(0.050)	(0.046)	(0.043)	(0.037)	(0.034)	(0.032)
Post Treatment	0.093***	0.053**	0.029	0.038*	0.024	0.011
	(0.029)	(0.026)	(0.021)	(0.021)	(0.020)	(0.017)
Stipend	0.043	0.003	-0.023	-0.014	-0.012	-0.016
	(0.054)	(0.044)	(0.035)	(0.039)	(0.030)	(0.027)
Cut off-Lit rate	0.007	0.005	0.004**	0.001	0.002	0.003**
	(0.005)	(0.003)	(0.002)	(0.005)	(0.002)	(0.001)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
N	1940	2507	2953	2875	3716	4373
R^2	.341	.342	.356	.312	.311	.321

Notes:
1) The dependent variable is an indicator for whether the girl is currently enrolled in school. MeanMean enrolment is 64.3 percent for girls aged 10-14 and 55.7 percent for girls aged 10-17.
(2) Bandwidth is calculated based on literacy rate as per 1998 census. For example, bandwidth of 10 includes districts with literacy rate of 10 percentage points above and below the cutoff point of 40 percent, as of 1998.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

B. Effect on Enrollment of Ineligible Children

Having established that the program was successful in increasing enrollment for older sisters, I now turn to the effects on younger siblings. Table XX and XXI explore the relationship between FSSF and enrollment of younger female and male cohorts, respectively. Column (1) and (2) show results for girls aged 5-9. Column (3) and (4) show results for girls aged 5-10. Average age to complete primary schooling is 10. I show results for these two groups separately as the effect on ten year olds can be interpreted as effect of the program. I control for demographic and household characteristics. In addition, I control for enrollment levels at baseline. All standard errors are clustered at stratum level.

The introduction of FSSF is associated with a modestly positive, yet statistically insignificant effect for younger cohorts. Table XX, Column (1) shows estimates for a simple difference-in-difference for girls in the age group 5-9, and Column (2) shows results after addition of controls. The coefficient on stipend shows that the probability of being enrolled for a girl in this age-group living in stipend districts is 30.3 percentage point lower than a girl of the same age living in stipend districts. Introduction of the program has 0.1 percentage point on the probability of enrollment. After addition of controls, the difference in probability of enrollment falls to 5 percentage point and the effect of the program rises to 2.4 percentage point. Both the effects, however, lack significance. Results for girls in the age group 5-10 are slightly higher. After the addition of controls, the effect of the program is 3 percentage point. Compared to the mean the program represents a 5.1 percent increase in enrollment for girls aged 5-9, and 6.3 percent increase for girls aged 5-10.

Next, I turn to enrollment for younger male cohorts. Table XXI explores the relationship between FSSF and enrollment of younger male cohorts. The format is the same as the previous table.

Column (1) and (2) show results for boys aged 5-9. Column (3) and Column (4) show results for boys aged 5-10. Though the effects lack significance, the magnitude is higher compared to the effect on girls. Simple difference in difference estimation shows that introduction of the program is associated with 3.8 percentage point increase in enrollment probability for boys aged 5-9 and 2.2 percentage point for boys aged 5-10. After adding controls, the effect rises to 4.3

TABLE XX. EFFECT ON ENROLLMENT OF YOUNGER GIRLS

	Age: 5-9	Age: 5-9	Age: 5-10	Age: 5-10
Stipend x Post Treatment	0.001	0.024	0.025	0.030
	(0.043)	(0.045)	(0.042)	(0.043)
Post Treatment	0.064***	-0.020	0.068***	-0.007
	(0.016)	(0.018)	(0.015)	(0.016)
Stipend	-0.303***	-0.050	-0.329***	-0.064**
	(0.044)	(0.032)	(0.044)	(0.031)
Controls	No	Yes	No	Yes
N	5865	4175	7100	5031
R^2	.0986	.357	.11	.362

Notes:
1) The dependent variable is an indicator for whether the girl is curren-enrolled in school. Mean enrolment is 66.3 percent for girls aged 5-9 and 67.6 percent for girls aged 5-10.
2) Mean enrolment for stipend districts is 47.1 percent for age-group 5-9 and 47.4 percent in age-group 5-10. Mean enroment for non-stipend districts is 77.3 percent for age-group 5-9 and 78.8 percent in age-group 5-10.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the house hold, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

percent point for the former group and 2.9 for the latter. The coefficient on stipend is less than 1 percentage point, for both groups, after addition of controls. As a comparison to the means, the increase in schooling 7.3 percent and 4.8 percent.

TABLE XXI. EFFECT ON ENROLLMENT OF YOUNGER BOYS

	Age: 5-9	Age: 5-9	Age: 5-10	Age: 5-10
Stipend x Post Treatment	0.038	0.043	0.022	0.029
	(0.032)	(0.028)	(0.028)	(0.024)
Post Treatment	0.065***	0.000	0.064***	-0.001
	(0.016)	(0.015)	(0.015)	(0.014)
Stipend	-0.230***	-0.012	-0.209***	-0.000
	(0.034)	(0.024)	(0.031)	(0.019)
Controls	No	Yes	No	Yes
N	6110	4337	7408	5259
R^2	.0573	.277	.0513	.273

Notes:
1) The dependent variable is an indicator for whether the boy is curren-enrolled in school. Mean enrolment is 71.8 percent for boys aged 5-9 and 73.2 percent for boys aged 5-10.
2) Mean enrolment for stipend districts is 58.5 percent for age-group 5-9 and 60.7 percent in age group 5-10. Mean enrolment for non-stipend districts is 79.3 percent for age-group 5-9 and 80.3 percent in age-group 5-10.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the house hold, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

C. Specification Tests

I present regression results for younger cohorts after restricting the sample to include districts within 20, 15 and 10 percent of the cut off rates. I focus on boys and girls in the age group 5-9. As shown in Table XXII and XXIII, the pattern is the same. After controlling for household and demographic characteristics, the coefficient ranges from 1 to 3 percentage points for girls, and 2 to 3 percentage points for boys. These results indicate that the introduction of the conditional cash transfer program, namely FSSF, is not associated with significant changes in enrollment for younger cohorts of males and females. The coefficients are not only statistically insignificant, but the point estimates after adding controls are extremely small[5].

In addition to this evidence, I break this group of boys and girls into children who have older sisters and children who do not have older sisters. Table XXVIII presents break up of results for girls aged 5-9. Column (2) presents results for girls who have no older sisters. The coefficient on stipend is -0.087 indication that living in a stipend district lowers the probability of enrollment by 8.7 percentage point. The effect of the program is 2.4 percentage points and lacks significance. Column (4) presents results for girls who have older sisters. The stipend district penalty is lower for this group, however, the effect of the program is 1.7 percentage point and also lacks significance.

Table XXIX presents break up of results for boys aged 5-9. The results for boys are different for those who have older sisters and those who do not. Boys who have older sisters experience an increase in enrollment probability of 1.3 percentage point, conditional on household, demographic, and baseline trends. The effect is not statistically significant. On the other hand, boys who have no older sisters experience an increase in enrollment probability of 7.6 percentage point, significant at 5 percent. The stipend penalty for this group is 5.9 percentage point, also significant at 5 percent.

[5]Table 15-18 present estimates of the effect of the program using regression discontinuity designs. The results present similar conclusions.

TABLE XXII. EFFECT ON ENROLLMENT OF YOUNGER GIRLS, SHORTER BANDWIDTH

	BW10	BW10	BW15	BW15	BW20	BW20
Stipend x Post Treatment	-0.048	0.010	-0.002	0.023	0.001	0.029
	(0.054)	(0.057)	(0.048)	(0.050)	(0.045)	(0.047)
Post Treatment	0.116***	-0.019	0.073***	-0.017	0.064***	-0.026
	(0.028)	(0.036)	(0.024)	(0.028)	(0.020)	(0.023)
Stipend	-0.167***	-0.018	-0.242***	-0.037	-0.281***	-0.044
	(0.055)	(0.036)	(0.050)	(0.033)	(0.048)	(0.032)
Controls	No	Yes	No	Yes		
N	3250	2334	4125	2953	4776	3413
R^2	.0447	.326	.0657	.335	.0868	.356

Notes:
1) The dependent variable is an indicator for whether the girl is currently enrolled in school. Mean enrolment is 66.3 percent for girls aged 5-9 and 67.6 percent for girls aged 5-10.
(2) Bandwidth is calculated based on literacy rate as per 1998 census. For example, bandwidth of 10 includes districts with literacy rate of 10 percentage points above and below the cutoff point of 40 percent, as of 1998.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XXIII. EFFECT ON ENROLLMENT OF YOUNGER BOYS, SHORTER BANDWIDTH

	BW10	BW10	BW15	BW15	BW20	BW20
Stipend x Post Treatment	0.025	0.036	0.034	0.034	0.027	0.033
	(0.038)	(0.038)	(0.033)	(0.031)	(0.033)	(0.029)
Post Treatment	0.094***	0.005	0.080***	0.012	0.077***	0.010
	(0.023)	(0.027)	(0.019)	(0.020)	(0.018)	(0.017)
Stipend	-0.155***	-0.003	-0.187***	-0.006	-0.208***	-0.005
	(0.047)	(0.030)	(0.039)	(0.027)	(0.036)	(0.025)
Controls	No	Yes	No	Yes	No	Yes
N	3411	2467	4334	3102	4990	3558
R^2	.0342	.277	.0425	.269	.0522	.274

Notes:
1) The dependent variable is an indicator for whether the boy is currently enrolled in school. Mean enrolment is 71.8 percent for boys aged 5-9 and 73.2 percent for boys aged 5-10.
(2) Bandwidth is calculated based on literacy rate as per 1998 census. For example, bandwidth of 10 includes districts with literacy rate of 10 percentage points above and below the cutoff point of 40 percent, as of 1998.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XXIV. EFFECT ON ENROLLMENT OF YOUNGER GIRLS, RDD

	Age: 5-9	Age: 5-9	Age: 5-10	Age: 5-10
Stipend x Post Treatment	0.002	0.027	0.025	0.032
	(0.043)	(0.045)	(0.042)	(0.043)
Post Treatment	0.065***	-0.022	0.070***	-0.009
	(0.016)	(0.019)	(0.016)	(0.017)
Stipend	-0.137**	-0.034	-0.170***	-0.047
	(0.052)	(0.034)	(0.052)	(0.032)
Cut off-Lit rate	0.008***	0.001	0.008***	0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Controls	No	Yes	No	Yes
N	5678	4064	6871	4890
R^2	.112	.359	.122	.365

Notes:
1) The dependent variable is an indicator for whether the girl is curren-enrolled in school. Mean enrolment is 66.3 percent for girls aged 5-9 and 67.6 percent for girls aged 5-10.
2) Mean enrolment for stipend districts is 47.1 percent for age-group 5-9 and 47.4 percent in age-group 5-10. Mean enroment for non-stipend districts is 77.3 percent for age-group 5-9 and 78.8 percent in age-group 5-10.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the house hold, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

TABLE XXV. EFFECT ON ENROLLMENT OF YOUNGER GIRLS, RDD, SHORTER BANDWIDTH

	Age: 5-9			Age: 5-10		
	BW=10	BW=15	BW=20	BW=10	BW=15	BW=20
Stipend x Post Treatment	0.008	0.008	0.008	-0.004	0.013	0.035
	(0.057)	(0.057)	(0.057)	(0.052)	(0.047)	(0.044)
Post Treatment	-0.015	-0.015	-0.015	0.006	0.007	-0.013
	(0.036)	(0.036)	(0.036)	(0.033)	(0.025)	(0.021)
Stipend	0.115**	0.115**	0.115**	0.103**	0.056	-0.000
	(0.053)	(0.053)	(0.053)	(0.045)	(0.038)	(0.032)
Cut off-Lit rate	0.016***	0.016***	0.016***	0.016***	0.011***	0.006***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.002)	(0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	2334	2334	2334	2784	3546	4105
R^2	.33	.33	.33	.34	.347	.366

Notes:
1) The dependent variable is an indicator for whether the girl is currently enrolled in school. Mean enrolment is 66.3 percent for girls aged 5-9 and 67.6 percent for girls aged 5-10.
(2) Bandwidth is calculated based on literacy rate as per 1998 census. For example, bandwidth of 10 includes districts with literacy rate of 10 percentage points above and below the cutoff point of 40 percent, as of 1998.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XXVI. EFFECT ON ENROLLMENT OF YOUNGER BOYS, RDD

	Age: 5-9	Age: 5-9	Age: 5-10	Age: 5-10
Stipend x Post Treatment	0.038	0.039	0.022	0.026
	(0.031)	(0.028)	(0.027)	(0.024)
Post Treatment	0.067***	0.002	0.065***	0.000
	(0.016)	(0.016)	(0.015)	(0.015)
Stipend	-0.117**	-0.014	-0.098**	-0.000
	(0.047)	(0.027)	(0.044)	(0.021)
Cut off-Lit rate	0.006***	-0.001	0.006***	-0.000
	(0.002)	(0.001)	(0.002)	(0.001)
Controls	No	Yes	No	Yes
N	5896	4187	7150	5088
R^2	.0648	.28	.0584	.275

Notes:
1) The dependent variable is an indicator for whether the boy is curren-enrolled in school. Mean enrolment is 71.8 percent for boys aged 5-9 and 73.2 percent for boys aged 5-10.
2) Mean enrolment for stipend districts is 58.5 percent for age-group 5-9 and 60.7 percent in age group 5-10. Mean enrolment for non-stipend districts is 79.3 percent for age-group 5-9 and 80.3 percent in age-group 5-10.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the house hold, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XXVII. EFFECT ON ENROLLMENT OF YOUNGER BOYS, RDD, SHORTER BANDWIDTH

	Age: 5-9			Age: 5-10		
	BW=10	BW=15	BW=20	BW=10	BW=15	BW=20
Stipend x Post Treatment	0.036	0.036	0.036	0.014	0.024	0.022
	(0.038)	(0.038)	(0.038)	(0.034)	(0.028)	(0.026)
Post Treatment	0.006	0.006	0.006	0.002	0.002	0.005
	(0.027)	(0.027)	(0.027)	(0.027)	(0.020)	(0.017)
Stipend	0.020	0.020	0.020	0.027	0.015	-0.001
	(0.060)	(0.060)	(0.060)	(0.048)	(0.032)	(0.025)
Cut off-Lit rate	0.003	0.003	0.003	0.002	0.001	-0.001
	(0.006)	(0.006)	(0.006)	(0.005)	(0.002)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	2467	2467	2467	2976	3753	4306
R^2	.277	.277	.277	.277	.269	.272

Notes:
1) The dependent variable is an indicator for whether the boy is currently enrolled in school. Mean enrolment is 71.8 percent for boys aged 5-9 and 73.2 percent for boys aged 5-10.
(2) Bandwidth is calculated based on literacy rate as per 1998 census. For example, bandwidth of 10 includes districts with literacy rate of 10 percentage points above and below the cutoff point of 40 percent, as of 1998.
3) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
4) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

Differential Trends

As mentioned above, the most important issue facing identification strategy is the possibility that some unobserved variable is driving the introduction of the program and changes in enrollment. For example, attitudes are hard to observe and quantity. Since these variables are likely to persist overtime, these effects would create pre-existing trends in the data. I have attempted to control for these pre-existing trends by controlling for observable household characteristics that are expected to cause such trends. It is important, however, to consider whether program introduction appears to be non-random beyond these controls.

I test for the possibility of pre-trends by looking at a group that is not impacted by the introduction of the program: boys aged 5-9 who have no sisters. The Female Secondary Stipend Program is offered to girls enrolled and attending secondary school. While boys who have no sisters may benefit from an information spillover of the program, they should not have a substantial effect on their enrollment. A large and significant effect on boys who have no sisters will indicate that the primary results obtained using difference-in-difference approach are biased. Table XXX shows the results. I control for demographic and household characteristics. In addition, I control for enrollment levels at baseline. All standard errors are clustered at stratum level.

Column (2) shows that after addition of controls, the introduction of the program has 1.5 percentage point increase in probability of enrollment for boys age 5-9 who have no sisters. This effect lacks statistical significance. These results should provide confidence that although the introduction of the program is not random, the primary drivers of correlation between the program and outcomes can be observed and are controlled for.

TABLE XXVIII. EFFECT ON ENROLLMENT OF YOUNGER GIRLS, BREAKUP

	No Older Sister	No Older Sister	Have Older Sister	Have Older Sister
Stipend x Post Treatment	0.019	0.024	-0.019	0.017
	(0.034)	(0.033)	(0.039)	(0.040)
Post Treatment	0.069***	-0.025	0.056***	-0.010
	(0.018)	(0.020)	(0.021)	(0.025)
Stipend	-0.340***	-0.087***	-0.257***	-0.004
	(0.024)	(0.028)	(0.028)	(0.032)
Controls	No	Yes	No	Yes
N	3328	2334	2537	1841
R^2	.118	.398	.0749	.317

Notes:
1) The dependent variable is an indicator for whether the girl is currently enrolled in school. Mean enrolment is 66.3 percent for girls aged 5-9 and 67.6 percent for girls aged 5-10.
2) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, teleph-one and gas connections.
3) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XXIX. EFFECT ON ENROLLMENT OF YOUNGER BOYS, BREAKUP

	No Older Sister	No Older Sister	Have Older Sister	Have Older Sister
Stipend x Post Treatment	0.047	0.076**	0.029	0.013
	(0.033)	(0.034)	(0.036)	(0.038)
Post Treatment	0.059***	-0.014	0.074***	0.016
	(0.017)	(0.020)	(0.020)	(0.024)
Stipend	-0.263***	-0.059**	-0.190***	0.037
	(0.024)	(0.029)	(0.027)	(0.032)
Controls	No	Yes	No	Yes
N	3362	2353	2748	1984
R^2	.0702	.318	.0431	.238

Notes:
1) The dependent variable is an indicator for whether the boy is currently enrolled in school. Mean enrolment is 71.8 percent for boys aged 5-9 and 73.2 percent for boys aged 5-10.
2) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, teleph-one and gas connections.
3) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

TABLE XXX. EFFECT ON ENROLLMENT OF YOUNGER BOYS, NO SISTERS

	No Sisters	No Sisters
Stipend x Post Treatment	0.033	0.015
	(0.028)	(0.030)
Post Treatment	0.067***	0.011
	(0.016)	(0.019)
Stipend	-0.205***	0.022
	(0.021)	(0.025)
Controls	No	Yes
N	4469	3211
R^2	.0524	.25

Notes:
1) The dependent variable is an indicator for whether the younger boy is currently enrolled in school.
2) Controls include region, baseline enrolment, household income and landown-ership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, telephone and gas connections.
3) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.

TABLE XXXI. EFFECT ON PRIVATE SCHOOL ENROLLMENT

	Girls, Age: 5-9		Boys, Age: 5-9	
Stipend x Post Treatment	-0.089***	-0.017	-0.073**	-0.003
	(0.032)	(0.024)	(0.036)	(0.019)
Post Treatment	0.114***	0.004	0.116***	-0.003
	(0.023)	(0.019)	(0.024)	(0.014)
Stipend	-0.198***	-0.012	-0.223***	-0.003
	(0.039)	(0.018)	(0.043)	(0.016)
Controls	No	Yes	No	Yes
N	5865	4175	6110	4337
R^2	.0795	.607	.0827	.668

Notes:
1) The dependent variable is an indicator for whether the child is currently enrolled in a private school.
2) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, teleph-one and gas connections.
3) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

Private School Enrollment

Another possible effect of the conditional cash transfer program is that as a result of an increase in income from stipends received, household may move younger siblings to private schools. Alam, Baez, Carpio (2011) find that private school enrollment for boys from ages 6 to 17 increased after program implementation. In Table XXXI, I present results for private school enrollment of younger boys and girls from age 5 to 9. However, after taking household and district characteristics into account, the estimated impact lacks statistical significance and the coefficients are close to zero. Table XXXIII presents results on private school enrollment for the eligible group, that is, girls from age 10 to 14. Similar to younger siblings, the conditional cash transfer program does not have an effect on private school enrollment. One explanation for these results is that the number of private schools is too low, especially in rural areas. Secondly, the change in public to private school may be a long term effect of the program.

TABLE XXXII. EFFECT ON PRIVATE SCHOOL ENROLLMENT, ELIGIBLE GIRLS

	Girls, Age: 10-14		Boys, Age:10-14	
Stipend x Post Treatment	-0.020	0.006	-0.031	-0.041*
	(0.027)	(0.026)	(0.031)	(0.022)
Post Treatment	0.063***	0.008	0.075***	0.020
	(0.022)	(0.019)	(0.021)	(0.016)
Stipend	-0.163***	-0.035	-0.131***	0.027
	(0.028)	(0.022)	(0.026)	(0.019)
Controls	No	Yes	No	Yes
N	5423	3727	5610	3881
R^2	.0436	.424	.0328	.428

Notes:
1) The dependent variable is an indicator for whether the child is currently enrolled in a private school.
2) Controls include region, baseline enrolment, household income and landownership, parent's education, age and employment, access to government school, access to private school, number of people in the household, children under 5 in the household, and access to electricity, teleph-one and gas connections.
3) Standard Errors are in paranthesis; clustered by stratum. *significant at 10 percent; **significant at 5 percent; ***significant at 1 percent

2.7 Discussion and Conclusion

In this paper, I find that the introduction of a conditional cash transfer to girls enrolled in secondary schools increased the probability of enrollment for girls between the age of ten to fourteen by nine percentage points. In addition, providing conditional stipends to older sisters does not have a negative effect on the enrollment probabilities for younger siblings, both boys and girls. In fact, the program has no effect on the enrollment of younger siblings. These results contradict the arguments presented in literature that introduction of conditional cash transfers in developing country context may result in a displacement effect, that is, less schooling for ineligible siblings.

There are several mechanisms through which the introduction of the program may effect educational outcomes of younger siblings. For example, it is generally expected and shown that older sisters are responsible for domestic duties. If the older sister is now going to school, parents in need of the cash transfer may take the younger sister out of school to perform the duties of the older child. Or in the opposite case, as the older sister goes to school, parents who are misinformed about the value of education, may learn and send the younger sister to school too. Brothers who previously had to work and earn income may now be able to go to school, facilitated by the income cash transfer. On the other, sisters who previously worked in an income generating occupation to pay for younger brothers education are now attending school, and those brothers would be taken out of school.

I argue that the findings in this paper support findings in other studies in the context of Pakistan. Hasan (2009) studied mothers time spent in domestic duties after the program. His study concludes that the introduction of the program is associated with more time spent by mothers in performing household duties. Alam, Baez, Carpio (2011) study school enrollment, primary and secondary school completion, and private/public school choice for boys aged 6-17 years. They dont find any effect on school enrollment and school completion. Their results on school choice, however, show a four percentage point increase in enrollment in private schools. Therefore, it does not seem that there are negative changes in educational outcomes of younger siblings.

The results in this paper allow policy makers to determine the spillover effects on younger

siblings when evaluating the effect of conditional cash transfer programs. The results are encouraging in that the program in Pakistan led to an increase in the enrollment of eligible group and show no negative effect on younger ineligible siblings.

2.8 Cited Literature

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3 VITA

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