Trade Liberalization and Worker Displacement:
Evidence from Trade Reforms in Colombia[1]

Marcela Eslava, Universidad de Los Andes
John Haltiwanger, University of Maryland and NBER
Adriana Kugler, University of Houston, NBER, CEPR, CReAM, and IZA
Maurice Kugler, Wilfried Laurier University and NBER

Abstract

There is widespread evidence on the positive effects of trade opening on reallocation and productivity in both developed and developing countries. However, much less is known about the effects of trade on workers displaced due to trade-related reallocation in developing countries. In this paper, we consider the impacts of a large trade reform on worker's wages, employment and unemployment spells in Colombia. Using the National Household Surveys for the years 1988 to 1998, we find that workers employed in less protected sectors earn lower wages, are less likely to be employed in the formal sector and have shorter tenures, after controlling for individual characteristics and year and sector effects, and that these effects are bigger for less-educated workers. In addition, we find that workers displaced due to plant closings during the period of trade liberalization also have lower wages and tenure and are less likely to be employed in the formal sector within the first two years after displacement, but that their wages, and quality and duration of employment recovers after three years of displacement. The time of recovery after displacement is faster than what is observed in the U.S. and other developed countries. On the other hand, we find that workers coming from less protected sectors experience shorter spells of unemployment, especially when they stay in the same sector and unemployment rates are low. Since trade opening hurts those currently employed but facilitates reallocation for those who end up unemployed, we also examine the overall effect of trade on household income using quantile regressions. Interestingly, we find that lower tariffs reduce household income only for female-headed households in the first two quintiles of the income distribution.

Key Words: Trade Liberalization, Worker Displacement, Plant Closings.

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1. Introduction

The reallocation of economic activity is often seen as a natural by-product of market economies. Some businesses close and others open, while some firms expand and others contract. This type of reallocation is often associated with market forces and increased competition. Most importantly, a number of careful studies based on micro-data find that reallocation is associated with increased average productivity in both developed and developing countries (see, e.g., Eslava et al. (2004, 2010), Foster, Haltiwanger and Syverson (2008), Baily, Campbell and Hulten (1992), and Olley and Pakes (1996)).

Productivity-enhancing reallocation associated with increased competition and market forces may translate into higher wages for workers and lower prices for consumers. On the other hand, this reallocation involves the turnover of workers, which may be costly. Establishments that close or shrink are forced to lay-off workers, while expanding establishments and new establishments hire new workers. Increased worker turnover is associated with market reforms, including the deregulation of labor and capital markets, and trade liberalization in other areas (see, e.g. Eslava et al. (2010), Autor et al. (2007), Haltiwanger et al. (2004), Revenga (1997, 1992)). Thus, worker turnover associated with increased competition should have a direct impact on employment and unemployment durations. Moreover, increased competition decreases rents for employers and should reduce workers' wage and non-wage benefits.

In this paper, we focus on the impact of reduced worker protection, due to decreased restrictions on mass layoffs and due to reduced trade barriers, on wages, employment and unemployment durations, and formal employment during a period of

increased mass layoffs and drastic trade liberalization in Colombia in the early 1990s. Colombia is an interesting country to consider for a number of reasons. First, a number of careful studies for Colombia have established that productivity-enhancing reallocation indeed took place following trade liberalization and other market-oriented reforms. Second, Colombia undertook a drastic and rapid process of trade opening in 1991 and reductions in restrictions to mass layoffs, so that if workers suffer employment and earnings losses due to trade liberalization and mass layoffs we should find evidence of this in the Colombian context.

Using data from the Colombian Household Surveys for the period from 1988 to 1998, we find that a decline of one standard deviation in effective tariffs reduces wages by 2.4% and that the decline in wages is experienced by less skilled workers. In addition, we find that a decline of one standard deviation in effective tariffs reduces the probability of formal employment by 3.6%. Moreover, while we do not find that tariffs are associated with longer employment spells, we find that higher effective tariffs in the previous job prolong the duration of unemployment, especially when people change sectors. In addition, we find that layoffs due to plant-closings during the period of trade liberalization decrease earnings as well as formal employment and the duration of employment but prolong unemployment spells. However, we find that after three years, the earnings, formal employment and tenure of those laid-off due to plant-closings recover up to the same levels as those who were not laid-off. This is relatively rapid recovery compared to displaced workers in other countries.

In summary, we find that not only the unemployed but also employed workers continue to face the costs from displacement due to plant-closings. By contrast, employed

workers suffer but unemployed workers benefit as a result of reduced tariff barriers. Moreover, as mentioned before workers may benefit as consumers from increased trade opening through reduced prices. Consequently, we examine the overall impact of trade opening and mass layoffs on households. We estimate quantile regression models and find that on average higher effective tariffs do not affect household income. However, we find that tariff reductions do translate into lower household income for those in the two lowest quintiles of the income distribution when the household is headed by a woman. We conjecture that in poorer households, when women earn rents, they share these with the rest of the household members. In female-headed households a decline of one standard deviation in average effective tariffs in the household reduces total income by 3.3%. By contrast, we find that total income falls substantially as a result of plant-closing related layoffs only for those at the higher-end of the income distribution.

Our results on wages and formal employment are consistent with previous analysis examining the impact of tariffs in developing countries. In addition, our analysis offers novel results on the impact of trade on unemployment durations and household income. Moreover, our analysis shows the impact of displacement related to plant-closings during the time of trade liberalization and finds interesting results on the time it takes for individuals to recover the wage and employment losses related to displacement.

The rest of the paper proceeds as follows. Section 2 discusses the institutional and labor market background in Colombia and provides a review of the related literature. Section 3 describes the Colombian Labor Force Surveys. Section 4 presents results on the effects of tariffs and plant-closings on employed and unemployed workers in Colombia.

Section 5 shows the impact of trade reductions and plant-closing on households. Section 6 concludes.

2. Background

2.1. Institutional Background

Prior to the1990s, Colombia's labor markets were subject to high payroll taxes, high dismissal costs and other restrictions on firing, raising costs for employers and giving an advantage to insiders. Moreover, restrictions on product and capital markets reduced competition and employment and increased rents that were partly shared with insiders. Additional costs to hiring in the formal sector and market power meant that, prior to the 1990s, more than half of Colombian workers were hired in the informal sector, where they are not protected by labor legislation.

In 1990 Colombia introduced severance payment savings accounts through Law 50, which helped to reduce dismissal costs for employers and increased turnover (Kugler (1999, 2004, 2005), Eslava et al. (2010)). Importantly, Law 50 reduced restrictions on mass layoffs, although these effects of the reduction in restrictions on mass layoffs have not been carefully studied. In 1993, Law 100 was introduced which turned the pay-as-you-go system into a fully funded system, while at the same time increasing payroll taxes (Kugler and Kugler (2009)). Analyses of these laws show that they introduced flexibility in the formal labor market and increased the size of the formal labor market. However, less work has been done on the costs borne by workers due to increased flexibility and the displacement associated with this flexibility. In what follows, we will analyze the impact of exogenous plant-closings on workers and we will analyze the time it takes for workers to recover from such displacement.

While labor market reforms were important, probably the most drastic reform in the Colombian context involved changes in trade policy. After considerable trade liberalization in the 1970s, the administration of President Belisario Betancurt implemented a reversal towards protection during the early 1980s in response to the appreciation of the exchange rate, which had contributed to increased foreign competition. Betancurt's policies increased the average tariff level to 27 percent in 1984, but the degree of protection across industries was far from uniform. Manufacturing sectors benefited the most from increased protection as the average tariff in manufacturing rose to 50 percent. However, even within manufacturing some sectors received more protection than others. The sector with the highest protection was textiles and apparel, which had nominal tariffs of nearly 90 percent, and wood products followed with a nominal tariff of 60 percent. These two sectors also had the highest levels of protection through non-tariff barriers.

While barriers to trade were reduced in the second half of the 1980s, trade was largely liberalized in Colombia during the first half of the 1990s. Figure 1 shows average effective tariffs and the standard deviation of effective tariffs starting in 1984. The effective tariff for a given final good adjusts the nominal tariff levied to the good itself, by subtracting the weighted sum of tariffs on the inputs used to produce that good, where the weights are given by the share of the input in production costs for that good (using the corresponding entry in the Input-Output table). From this initial level, the figure shows a substantial decline both in average effective tariffs and the dispersion of these tariffs in 1985. The figure then shows a gradual decrease in tariffs which started during the administration of President Virgilio Barco in the late 1980s.

In 1990, the administration of President Cesar Gaviria introduced a comprehensive reform package, which included measures to modernize the state and liberalize markets. As mentioned above, the Gaviria government quickly introduced important labor market reforms. However, the new administration also introduced reforms in the areas of capital markets, privatization and the tax system and most notably in the area of trade. The average nominal tariff declined from 27 to about 10 percent overall, and from 50 to 13 percent in manufacturing, between 1984 and 1998. As Figure 1 shows, there was a drastic drop in average effective tariffs and in the dispersion of effective tariffs between 1990 and 1992 during the Gaviria administration. By 1992, the average effective tariff was at 26.6% compared to 62.5% in 1989 and compared to 86% in 1984. Similarly, the dispersion of tariffs fell substantially during the early 1990s, though dispersion across industries still remained substantial as the standard deviation of tariffs remained at around 0.2. At the same time, between 1990 and 1992, the average non-tariff barrier dropped to 1.1 percent. After Gaviria's term, Ernesto Samper won the presidential election in 1994 based on a platform which partly opposed trade liberalization and other reforms. While the new government did not dismantle the existing reforms at the time, it managed to stop the momentum for further liberalization. This is clear in Figure 1, which shows that the average and standard deviation of effective tariffs remain flat after 1992.

The description above makes clear that there were important changes in both the mean level and the dispersion of tariffs across sectors. An interesting aspect of the Colombian trade reforms is that at the same time that the overall level of protection was lowered, the sectoral structure of protection was also substantially altered as barriers to

trade were lowered to similar levels across sectors irrespective of their initial level. Our previous work finds evidence that reduced tariffs increases productivity by weeding out the least productive plants at the lower end of the productivity distribution but also by reallocating production away from low productivity and towards high productivity continuing plants and by increasing productivity within continuing plants (Eslava et al. (2008)). However, much of the increase in productivity occurs through costly reallocations for workers. Here we ask how reduced trade protection affected employment, the chances of getting new jobs, and the wages of those that continued to be employed in the affected sectors. We expect for reduced tariffs to increase competition and reduce employment and, in particular, costly formal employment. At the same time, tariff reductions reduce rents for employers and workers and thus should reduce the wage payments of workers in the affected sectors.

2.2. Related Literature

This paper relates to two strands of literature. On the one hand, the paper relates to the literature examining the impact of reduced employment protections on workers. On the other hand, it relates to the literature looking at the impact of reductions in trade protections on workers.

There is an extensive literature looking at the impact of reduced employment protections on workers. Most of this literature examines the impact of changes in employment protection legislation on workers focusing on changes in dismissal costs (e.g., Autor et al. (2007), Heckman and Pages (2004), Kugler (1999, 2004), Kugler and Pica (2008), Kugler and Saint-Paul (2005), Lazear (1990)). However, within this literature a number of papers also examine the impact of reduced restrictions of mass

layoffs and plant-closings on workers and the related costs of displacement. Much of this literature relates to mass layoffs and plant-closings in the U.S, but there are a growing number of studies looking at the consequences of plant-closings in other countries. The most notable paper on the topic is Lalonde et al. (1993), which finds that high-tenure workers separating from distressed firms experience earnings losses of up to 25% a year and that these losses last for a long period of time and reach up to $50,000 six years after displacement. Other studies for the U.S. also find that high tenured workers are likely to suffer greater displacement-related wage losses (Kletzer (1989), Ruhm(1990), and Topel (1990). The papers in Kuhn (2003) compile studies of the costs of displacement for 10 developed countries, including the U.S., U.K, Australian, Canada, the Netherlands, Japan, France, Germany, and Belgium, and find interesting stylized facts. Less educated and older workers are more likely to suffer in terms from prolonged non-employment after displacement. However, in terms of earnings losses, the positive relation between tenure and displacement-related wage losses is observed in the U.K. and Canada, but not in other countries. Here we will examine displacement related losses in terms of unemployment spells and wages in the context of a developing country.

Our work also relates to reduced employment protection due to trade opening. There is a large literature looking at the distributional effects of trade liberalization (see Goldberg and Pavcnik (2006) for a complete review of this literature). The main focus of this literature has been on the skilled/unskilled wage differential since standard trade theory suggests that unskilled wages should increase in countries abundant in unskilled labor. Contrary to this, however, most studies find an increase in the skill premium in developing countries (e.g., Attanasio et al. (2004), Robbins (1996); Borjas and Ramey

(1995)). In addition, a number of studies have found that trade liberalization is associated with a decline in wage premia and an increase in income volatility (e.g., Goldberg and Pavcnik (2004); Krebs, Krishna and Maloney (2005); Revenga (1997); Borjas and Ramey (1995)). Few studies focus on the impact of trade liberalization on unemployment and households. The study by Attanasio et al. (2004) is the only study to examine the relation between trade barriers and the likelihood of unemployment and they find no evidence of any relation. However, other studies have focused on the impact of trade protections on employment and the quality of employment. Most studies find a reduction in employment and, in particular, formal employment in sectors affected by trade liberalization (Goldberg and Pavcnik (2003), Revenga (1997), Borjas and Ramey (1995)). Here we examine not only the impact on wages, employment duration and the likelihood of formal employment, controlling for individual characteristics and year and sector effects, but we also look at the impact of trade on unemployment durations. Moreover, unlike most studies in the literature on trade and workers, we also examine the impact of trade shocks on households.[2] Trade may affect households through the labor income channel through all household members. Moreover, trade liberalization is likely to affect labor income both negatively and positively by affecting not only employment but also unemployment. In addition, trade liberalization is also likely to affects households by affecting the prices they pay. We look at all of these channels by considering the impact of trade liberalization on real household income and by considering all household members affected from trade liberalization.

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[2] Only Topalova (2005) and Nicita (2004) look at the impact of trade barriers on poverty and consumption. Topalova (2005) finds no effect on consumption inequality but does find less of a reduction in poverty in regions exposed to greater tariff cuts. Nicita (2004)

3. Data

The data from our analysis comes from the Colombian Household Surveys, collected by the National Department of Statistics, and merged with tariff data provided by the Colombian Planning Department.

We use the Colombian National Household Surveys (NHS) conducted in June because these surveys ask information on whether employed workers are covered or not labor legislation, on the characteristics of their previous job (including sector of employment and the reason why the person left the previous job) and on the duration of unemployment prior to joining the current job. The June NHSs, thus, contain information that allows us to construct a formality indicator and unemployment spells, which are outcome variables of interest in our analysis. In addition, the June surveys allow us to merge the information on sector in the previous job to obtain tariffs in the previous job. Importantly, these surveys allow us to identify displaced workers using the information on why the person left the previous job.

The June surveys are conducted every two years, so we use data from June 1988, 1990, 1992, 1994, 1996 and 1998, which covers a period before and after the large change in tariffs described in Figure 1. The June surveys are only conducted in the 9 largest cities of the country, including: Bucaramanga, Bogota, Manizales, Medellin, Cali, Pasto, Villavicencio, Pereira and Cucuta.

The surveys include detailed information on demographic characteristics, labor and non-labor income sources, and current and retrospective information on labor market participation. In terms of demographic characteristics we have information on gender, age, completed years of schooling and whether the person is the head of the household or

not. In terms of the individual outcome variables, we focus on the real hourly wage, an indicator of weather the person is employed in the formal sector, tenure in the current job and unemployment duration. The formal sector indicator takes the value of one if the person is covered either by health benefits or pension benefits or both and zero otherwise. In addition, we also focus on the impact of displacement and tariffs on total household income. The displacement dummy takes the value of 1 if the person lost their job due a plant closing and zero otherwise. A detailed description of the construction of these variables is provided in the Appendix.

Data on effective tariffs at the product level come from the National Planning Department. Products are assigned to their respective 1-digit sector, so we construct effective tariffs at the one-digit level by averaging effective tariffs across products in a given sector and assigning a zero to non-tradable sectors. The effective tariffs for the last and current job may differ because of differences in the current and previous sector of employment and/or because of changes in tariffs over time in the same sector. In our analysis, we will be using effective tariffs in the current job to look at the effects on current earnings, formal employment and duration of employment and the effective tariffs in the previous job to examine the effects on unemployment duration. Since we control for sector effects in all our analysis, here we exploit change in tariffs within sector over time. Three points are worth indicating with regards to the use of effective tariffs. First, we prefer the effective tariffs measure because it captures the total effect of trade liberalization including the effect of competition in output markets as well as increased access to input markets, while nominal tariffs only capture the first effect. Second, while trade reforms involved both changes in tariffs as well as changes in non-tariff barriers

such as quotas, Goldberg and Pavcnik (2007) report that the two are highly correlated. Third, while one may be concerned with the endogeneity of changes in tariffs if for example sectors with more market power lobby to keep protection, Eslava et al. (2009) find that tariffs are not correlated with the Herfindhal Index, which is a good measure of market concentration. Moreover, the main goal of the Colombian government was to lower tariff levels across sectors to more uniform levels (as illustrated by the reduction of the variance of tariffs in Figure 1), suggesting that lobbying groups may not had been able to exert much influence in terms of the magnitude of tariff changes over the reform period.

Table 1 shows the descriptive statistics for the variables we use in the individual level regressions for the overall sample, and split by whether the person is employed in a sector above or below the average effective tariffs and split by whether the person was displaced due to a plant-closing or not. Comparing those in more and less protected sectors shows that real wages and unemployment durations are lower in sectors with above average tariffs but formal employment and tenure are higher. However, the average years of schooling are also lower for those in less protected sectors, so that one needs to control for education and demographic characteristics. Those in protected sectors are also more likely to have been laid off due a plant closing, so that one would want to control for this. In addition, this comparison may be confounding other characteristics of the sectors with high tariffs, such riskiness in the jobs in the sector, volatility in the sector and other factors which may influence wages and duration of employment and unemployment. Comparisons between those laid off due to a plant-closing and others shows that those affected by plant closing have lower real wages and

are less likely to be formal, but have longer employment and unemployment durations. However, these workers are also less educated, older and are more likely to be male.

Table 6 shows similar descriptive characteristics but for the sample of households used in the analysis of household income and also includes the additional variables used in the household level regressions. Comparing households with heads working in sectors with tariffs above and below the average effective tariff shows that households with heads in more protected sectors have lower household income and their heads have lower wages and unemployment spells and are less educated and more likely to have been laid off due to a plant closing, but also have higher tenure and are more likely to be formal. Household income is also lower for those with a household head laid off due to a plant closing, as are the wages of the household head, their tenure and schooling and their likelihood of being employed in the formal sector, but their unemployment spells are longer.

In what follows we will analyze the impact of the reduction in tariff protection and displacement due to plant closures on workers and their families.

4. Effects of Trade-related and Mass displacement on Workers

4.1 Effects on Wages and Employment

We estimate the following regression to examine the impact of the reduction in trade barriers and mass displacement on workers:

$$Y_{ijct} = \psi_j + \tau_t + \pi_c + X_{it}'\beta + \theta_0 Tariff_{jt} + \theta_1 Tariff_{jt} \times Closing_{it-s} + \gamma Closing_{it-s} + \varepsilon_{ijct}$$

(1)

where ψ_j, τ_t, π_c and are sector, time and city effects, X_{it}

include characteristics of individual i at time t (including age, education, gender, head of household status), and Tariff$_{jt}$ and Closing$_{it-s}$ are the variables of interest, mainly the effective tariff in sector j at time t and an indicator of whether the person i was laid off due to a plant-closing in the previous job in period t-s. The coefficient on the interaction term between the two captures the effect of tariffs on the current job for those who were displaced due to a plant closing in the previous job. In addition, we try specifications where we explore differential effects of tariffs for more and less-skilled workers. This is because we expect trade liberalization to have differential effects on different skill groups. Standard trade theory suggests that in countries which are relatively abundant in less-skilled labor, like Colombia, trade liberalization should raise the wages and employment of less-skilled relative to more-skilled workers. However, as pointed out in Section 2, the evidence suggests otherwise and more complex models of trade would suggest otherwise. First, Colombia may be a country with intermediate skill intensity as opposed to low skill intensity. Second, trade may induce quality upgrading, skill-biased technical change, inflow of new capital and outsourcing all of which may increase the demand for high-skilled labor and may reduce the demand for less-skilled relative to more skilled labor. To examine whether trade protection helps less or more skilled workers more, we estimate the following regression:

$$Y_{ijt} = \psi_j + \tau_t + \pi_c + X_{it}'\beta + \theta_0 \text{Tariff}_{jt} + \theta_1 \text{Tariff}_{jt} \times \text{Lowed}_{it} + \delta\, \text{Lowed}_{it} + \gamma \text{Closing}_{it-s} + \mu_{ijct}$$

(2)

Where Lowed takes the value of 1 if the person has a level of schooling below the average level of schooling in the sample (i.e., 8.67 years as indicated in Table 1), and the

coefficient on the interaction between this indicator and effective tariffs shows the differential effect of protection on less-skilled workers.

Table 2 reports results from regressions, as in equation (2), of real hourly wages, formal employment and tenure. The results show that tariffs increase earnings and the quality of employment, or vice-versa trade liberalization reduces wages and formal employment. In particular, a reduction in tariffs of one standard deviation reduces wages by 2.3%, and the likelihood of being employed in the formal sector by 0.02. Interestingly, the effect of tariffs on wages is smaller for those who were previously displaced. In particular, a reduction in tariffs only reduces wages by 0.4% for displaced workers Table 3 shows results from regressions of the type in equation (3). These results indicate that tariff protections increase earnings for less-skilled but not for more skilled individuals. Alternatively, trade liberalization hurts the earnings potential for less skilled but does not affect the earnings of the more skilled workers. A reduction of one standard deviation in effective tariffs reduces wages of the unskilled by 2.8%.

The results in both Tables 2 and 3 show that displacement due an exogenous plant-closing in the previous job reduces wages, formal employment and tenure on the current job. In particular, those laid-off due to a plant-closing experience a reduction in wages of 2.7% and a reduction in the probability of formal employment of 0.02 and a reduction in tenure of close to two months. We also examine the dynamics of displacement by including different indicators if the person was displace during the past year, between 1 and 2 years ago, and more than 2 years ago. This allows us to examine if displaced workers are scarred or blemished by the experience of being laid off due to a plant-closing. In particular, if the displaced workers recover after a few years of

displacement compared to their non-displaced counter-parts, then this is considered a blemish. However, if the negative impact stays for a long time or permanently, then this is considered scarring. The results in table 4 show that the effect is largest if a person was displaced in the past couple of years, but that the effect either disappears or may even turn positive if the person was displaced more than two years ago. The p-values of differences of coefficients are less than 0.01 for differences in the formal employment and tenure regressions, but not in the wage regressions. The results also show that the effects of tariffs are lessened, especially for those displaced more than two years ago. We also tried similar specifications, but including indicators for whether the person was displaced during the last year or 1 to 10 years ago. The coefficients and confidence intervals of these indicators in wage, formal employment and tenure are plotted in Figures 2-4. One may think that the composition of those who lost their jobs during the past year should be different from the composition of those who lost their jobs 10 years ago. In particular, one may expect that the re-employed after less than a year of displacement will be particularly able or motivated individuals, while after ten years most displaced workers have probably already found jobs. However, this would bias the results against finding an immediate effect and towards finding a larger negative effect many years after displacement. Instead, we find exactly the opposite pattern, suggesting that the biases are small or we that the actual effects are so large that the biases do not distort the picture in the direction explained. Figure 2 shows that the negative displacement effect on wages is particularly strong in the first three years, but starts to disappear after the fourth year, when the confidence interval includes a zero effect. Figure 3 shows the negative displacement effect on formal employment in the first two years, after which the effect

disappears. The effect on tenure has much tighter confidence intervals and clearly shows that displaced workers suffer blemishes until three years after displacement, after which time they bounce and even surpass those who are not displaced. Interestingly, these effects are even shorter-lived than the results for young workers in the U.S., which show a recovery after five years even though they should suffer the least loss of specific human capital (Kletzer and Fairlie (2003)).[3]

4.1 Effects on Unemployment

The only study that examines the impact of tariffs on unemployment is a study by Attanasio et al. (2004), but this study looks at the impact of tariffs on the probability of unemployment and finds no effect. The reason why it is so difficult to examine the link between trade protection and unemployment is that one does not usually have information on the level of protection to which the unemployed have been subject to. Since we have sector of employment in the previous job and time at which the person was employed in that job, we can identify tariffs in the previous job for the unemployed. Also, our analysis differs from Attanasio et al. (2004) in that instead of looking at the discrete response of unemployed/employed or out of the labor force, we examine the impact on the duration of unemployment so that we can see if the response occurs at the internal margin.

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[33] All the regressions on wages, formal employment and tenure are estimated for a sample of employed workers, so we may expect for these results to suffer from selection bias. If the same factors that drive someone to be employed drive a person to have higher wages, to be more likely to be formal and to have longer tenure, then the results we reported above would be biased upwards. However, the effect of effective tariffs is positive while the effect of displacement is negative. In the case of effective tariffs the effect would be over-estimated if employment in a protected sector is positively correlated with the unobservables but under-estimated if on there is a negative correlation between tariff and the unobservables. On the other hand,, displacement due to a plant-closing is likely uncorrelated with these unobservables..

Since we have information on months of unemployment, we use a Weibull duration model to estimate the effect of both tariffs and displacement due to plant-closing on unemployment spells. We estimate a Weibull hazard model to examine the impact of tariffs in the previous job and displacement status on the likelihood of exiting unemployment given that the person is unemployed at a point in time. In particular, we estimate the following model:

$$f(s) = \alpha \times \lambda^{\alpha} s^{\alpha-1} \exp\{ -(\lambda s)^{\alpha} \},$$

where s is the spell of unemployment; α is the shape parameter, which implies that the hazard increases or decreases monotonically depending on whether $\alpha > 0$ or $\alpha < 0$; and $\lambda = \exp\{ \psi_j + \tau_t + \pi_c + X_{it}'\beta + \theta Tariff_{jt-s} + \gamma Closing_{it-s})$ and in other specifications λ also includes an indicator of whether the person changed sectors and current unemployment interacted with tariffs in the previous job.

Table 5 reports the marginal effects from estimating these parametric duration models. The results show that higher protection in the previous job and displacement due to a plant closing increases the duration of unemployment. Moreover, we check to see if the effects differed for those who changed sectors. We find, that those that changed sectors suffered longer spells, but perhaps the causality goes in the opposite direction since we may expect for those that have been unemployed the longest to finally decide to look for jobs in other sectors. In addition, we find that higher protection is especially hurtful for those who changed sectors. We may expect that if protection is very high, people may persist in looking for jobs in that sector and only change when things are no longer viable. Finally, we examine how the effect of tariffs changes depending on the

current unemployment rate. We find that trade liberalization is most hurtful in terms of prolonged unemployment when the unemployment rate is higher.

5. Effects of Trade-related and Mass Displacement on Households

Interestingly, while we find that displacement has uniformly negative effects on both employed and unemployed workers, we find both positive and negative effects of trade liberalization on the labor incomes. On the one hand, we find that trade liberalization reduces wages, tenure and formal employment for employed workers. On the other hand, we find that the unemployed suffer from shorter spells when trade is liberalized. Thus, labor incomes may increase or decrease for a household when trade liberalization takes place since some individuals will be employed and others unemployed. Moreover, while trade opening is often associated with lower incomes through the labor income channel, trade also affects the prices that individual members of a household pay as consumers. However, unless price changes due to trade liberalization affect those working in trade-affected sectors differently, we will not be able to capture the price effects in our analysis.

Since the effects of trade are ambiguous, we examine quantile regressions where we examine the impact of effective tariffs and displacement on real household income. In particular, we estimate quantile regressions where we focus on quintiles of the distribution and where the coefficients minimize the product of the 'check function', $\rho_\kappa=1(\hat{u}>0)\times\kappa\times|\hat{u}| + 1(\hat{u}\leq0)\times(1-\kappa)\times|\hat{u}|$ (where $\kappa=0.2,0.4,0.6,0.8$, indicate the quintiles in the distribution of household income), and the residual of the regression in each quintile. This means that under-predictions are given a higher weight at the lower quintiles and over-predictions are given a higher weight at the higher quintiles. Our vector of

regressors includes city, year and sector effects, age, gender and education of the head of household, as well as number of household members, and our main regressors of interest, an indicator of whether the household was displaced from the previous job and the average effective tariffs of all employed members in the household. In addition, we try specifications where we also include interactions of the average effective tariff in the household with a female head-of-household indicator in order to understand if rents are more likely to affect household income when the head of the household is a woman.

The first four columns in Table 7 report results for the various quintiles from quantile regressions of household income on a displacement indicator for the head of household and the average effective tariff in the current job for all household members. The results show that displacement reduces household income for those in the second, third and fourth quintiles of the distribution but not for those in the first quintile and that the effects are greatest for those in the highest two quintiles. In particular, displacement reduces income by about 6% for the highest quintiles.

On the other hand, the results do not show any effect of tariffs on household income for any quintile in the distribution. Even though we found evidence in the previous sections that higher current tariffs should increase income, it is possible that other sources of income (e.g., remittances or government transfers) are reduced in response to higher labor income. While less plausible, it could also be that higher prices due to protection hurt, especially, those employed in protected sectors. The next four columns include an interaction of effective tariffs with an indicator for weather the head of the household is a woman. Previous studies have found evidence against the 'unitary' or 'common preference' model of the household (e.g., Duflo (2003), Lundberg et al.

(1996), and Thomas (1990)) as they find that the gender of the family member who receives or controls the income affects the allocation of resources within the household. Here we examine whether the gender of the person who controls the income affects the amount of labor rents transferred to the household. We test whether rents earned due to trade protection are more likely to be shared with the rest of the household members when the household head is a woman. If the person earnings the rents is the woman herself, then she may transfer more of the rents because she knows that she will be the one allocating resources within the household. However, even if others are earning rents, they may transfer more income to the household if they believe that their preferences are better aligned with a head of household who is a woman. We find that in poor households, higher effective tariffs increase household income in female-headed households but not in male-headed household. A one standard deviation increase in effective tariffs reduces household income by 3.3% in female headed households in the two lowest quintiles of the income distribution compared to male-headed households. However, given that the reduction in tariffs after the trade reform of 1991 was over 4 standard deviations, the results suggest that the effect of the reduction in tariffs after the reform was to decrease the income of poor female-headed households by around 14% compared to poor male-headed households. On the other hand, at the higher end of the income distribution, it does not make a difference whether the household head is a male or a female. These results suggest that a 'unitarian' model of the household is probably inappropriate framework to think about lower income households in Colombia. The results also suggest that while some of the effects of reduced trade protection are undone within households, this does not seem to be the case for poor female-headed households.

While not reported here, we also estimated models using effective tariffs in the previous job, both with and without interactions with the female-headed dummy, and found no effects on household income in this case, suggesting that any negative effects of tariffs through reduced unemployment are not reflected in changed household income.

6. Conclusion

While increased market competition and reduced protections may facilitate productivity-enhancing reallocations, this involves the turnover of workers which may be costly to them and their families.

In this paper, we examine the consequences of reduced protection due to trade liberalization and mass dismissals on workers and their families. We find that the reduction in tariffs following the 1991 trade reform reduced wages and formal sector employment especially for less-skilled workers, but also reduced unemployment spells for those seeking jobs. Interestingly we find that the latter does not translate into higher income for households affected by the reforms. On the other hand, reduced tariffs lower household income for poor female-headed households compared to male-headed households, implying that trade liberalization has adverse effects on the most vulnerable households. However, the effects of trade on workers seem to be neutralized at the household level for households in the higher quintiles.

Mass dismissals during the period of trade liberalization, however, have uniformly adverse effects on employed and unemployed individuals. In particular, displacement due to plant-closings reduces earnings, formal employment, and tenure and prolongs unemployment spells. However, we find that the reduction in earnings, formal

employment and earnings is largely a blemish as they are not long-lived. After around three years after displacement, displaced workers appear to have bounced back to the levels of the non-displaced workers. This is a quick recovery and faster than what is found for the U.S. However, contrary to lost trade protection, displacement of the household-heads does translate into lower income for these households compared to households with non-displaced heads, but mostly for those at the higher end of the income distribution. Thus, mass dismissals are particularly costly for those at the higher end of the income distribution, while reduced trade protections are particularly hurtful to the most vulnerable households, i.e., poor households with a female-head.

These results have interesting policy implications as they suggest that some policies that hurt workers individually may not have consequences at the household level. Also, the results suggest that when households are not able to absorb negative shocks, these effects are felt differently by poor and rich households depending on the type of shock.

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Data Appendix

This paper uses the National Household Surveys conducted in June, which include a special section on informality as well as additional questions on the present and past employment of currently employed workers and their unemployment spells between the two jobs. Below, we describe the construction of the various variables used in the analysis.

Real Hourly Wage: earnings can be reported monthly, bimonthly, every ten-days and weekly. We transform all earnings into weekly earnings and, then, divide by the average weekly hours reported in the survey. Then, we deflate the nominal hourly wage using city-level deflators.

Employment and Unemployment: Durations: the current employment duration or tenure is reported in years and includes only incomplete employment spells. The unemployment duration is reported in months and included completed spells, as these are the spells between the previous and the current jobs for currently employed workers.

Formality: Individuals are classified as being employed in the formal sector if either they are covered by social security contributions or health benefits or both. By contrast, informal workers are all workers who are not covered by pension or health benefits.

Displacement: currently employed workers are asked why they left their previous job. We classify workers as displaced if they report that they left the job because the company went bankrupt or faced financial problems.

Household Income: the total income of the household adds all labor and non-labor income of employed individuals who live in the household and all non-labor income of individuals who are either unemployed or out of the labor force. Non-labor income includes income from: interest from interest-earnings accounts or bonds, leasing of property, pensions, monetary transfers from family and friends and other sources.

Table 1: Descriptive Statistics

	All	Above average tariff	Below average tariff	Bankruptcy Layoff	No Bankruptcy Layoff
Age	33,3192	32,8709	33,5474	35,2915	33,1202
	(9.7807)	(9.3098)	(10.0044)	(10.158)	(9.7198)
Fraction Male	0,5774	0,6393	0,5459	0,6001	0,5750
	(0.4939)	(0.4802)	(0.4979)	(0.4899)	(0.4943)
Years of Schooling	8,6661	8,2228	8,8917	8,3608	8,6968
	(4.1027)	(3.6112)	(4.3142)	(3.7749)	(4.1332)
Real Wage	4346	3913	4566	3821	4399
	(8912)	(8633)	(9044)	(4626)	(9233)
Probability of Formal Employment	0,5519	0,6116	0,5215	0,5280	0,5544
	(0.4972)	(0.4873)	(0.4995)	(0.4992)	(0.4970)
Tenure	2,1022	2,3639	1,9690	2,2335	2,0890
	(2.9986)	(3.3061)	(2.8201)	(3.0300)	(2.9952)
Unemployment Duration	3,7922	3,5991	3,8906	4,7973	3,6928
	(5.7462)	(5.5621)	(5.8354)	(6.2347)	(5.6860)
Effective tariff in current job	16,4607	24,2890	12,4755	16,8611	16,4203
	(9.4189)	(9.6758)	(6.2562)	(9.0719)	(9.4523)
Effective tariff in previous job	20,0001	27,8266	16,0158	22,3075	19,7674
	(16.0025)	(17.6656)	(13.4361)	(16.4351)	(15.9399)
Fraction Laid-off due to Bankruptcy	0,0916	0,1087	0,0828		
	(0.2884)	(0.3113)	(0.2756)		
Max N	32.762	11.052	21.710	3.001	29.761

Notes: the table reports means and standard deviations in parenthesis.

Table 2: Effects of Trade Liberalization and Bankruptcy on Wages and Employment

	Wages		Formal Employment		Tenure	
	(1)	(2)	(3)	(4)	(5)	(6)
Effective tariffs in current job	0.0024***	0.0025***	0.0021***	0.0021***	0.0000	0.0004
	(0.0008)	(0.0008)	(0.0006)	(0.0006)	(0.0037)	(0.0037)
Bankruptcy layoff	-0.0362***	-0.0012	-0.0197**	-0.0234	-0.1460***	-0.0514
	(0.0114)	(0.0239)	(0.0087)	(0.0183)	(0.0541)	(0.1133)
Effective tariffs x Bankruptcy layoff		-0.0021*		0.0002		-0.0056
		(0.0012)		(0.0010)		(0.0059)
R²	0.37	0.37	0.17	0.17	0.12	0.12
N	32.762	32.762	32.743	32.743	32.872	32.872

Notes: The table reports coefficients of regressions of log hourly wages, an indicator of whether the person works in the formal sector, and tenure on the effective tariff in the current job and an indicator of whether the person was laid-off from their previous job due a plant-closing. All regressions control for city, sector and year effects, as well as age, education, and an indicator for whether the person is the household head. Robust standard errors are in parenthesis.

Table 3: Effects of Trade Liberalization and Education on Wages and Employment

	Wages	Formal Employment	Tenure
	(1)	(2)	(3)
Effective tariffs in current job	0.0002	0.0039***	-0.0008
	(0.0011)	(0.0008)	(0.0051)
Bankruptcy layoff	-0.0268**	-0.0203**	-0.1512***
	(0.0112)	(0.0087)	(0.0541)
Less-educated	-0.4308***	0.0648***	0.1907**
	(0.0195)	(0.0151)	(0.0938)
Effective tariffs x Less-educated	0.0030***	-0.0024***	0.0012
	(0.0010)	(0.0008)	(0.0049)
R^2	0,39	0,18	0,12
N	32.762	32.743	32.872

Notes: The table reports coefficients of regressions of log hourly wages, an indicator of whether the person works in the formal sector, and tenure on the effective tariff in the current job and an indicator of whether the person was laid-off from their previous job due a plant-closing. All regressions control for city, sector and year effects, as well as age, education, and an indicator for whether the person is the household head. These regressions also control for an indicator of whether the person has less education than the mean level in the population and an interaction of this low-education dummy with effective tariffs in the current job. Robust standard errors are in parenthesis.

Table 4: Effects of Time Since Bankruptcy Layoff on Wages and Employment

	Wages		Formal Employment		Tenure	
	(1)	(2)	(3)	(4)	(5)	(6)
Effective tariffs in current job	0.0024***	0.0025***	0.0021***	0.0021***	-0.0001	0.0010
	(0.0008)	(0.0008)	(0.0006)	(0.0006)	(0.0036)	(0.0036)
Bankruptcy layoff during last year	-0.0286	-0.0236	-0.0995***	-0.1122***	-1.9732***	-1.6798***
	(0.0236)	(0.0465)	(0.0180)	(0.0356)	(0.1101)	(0.2171)
Bankruptcy layoff between 1-2 years ago	-0.0500***	-0.0368	-0.0317**	-0.0139	-1.2419***	-0.9759***
	(0.0182)	(0.0484)	(0.0139)	(0.0370)	(0.0849)	(0.2260)
Bankruptcy layoff more than 2 years ago	-0.0279	0.0403	0.0325**	0.0275	1.7807***	2.0651***
	(0.0172)	(0.0345)	(0.0131)	(0.0264)	(0.0802)	(0.1612)
Effective tariffs x Bankruptcy layoff during last year		-0.0003		0.0007		-0.0164
		(0.0022)		(0.0017)		(0.0104)
Effective tariffs x Bankruptcy layoff between 1-2 years ago		-0.0008		-0.0012		-0.0173
		(0.0029)		(0.0023)		(0.0138)
Effective tariffs x Bankruptcy layoff more than 2 years ago		-0.0039**		0.0003		-0.0162**
		(0.0017)		(0.0013)		(0.0079)
P value for Wald Test Ho: Layoff last yr. = Layoff 1-2 yrs. Ago	0,46	0,84	<0.01	0,05	<0.01	0,02
P value for Wald Test Ho: Layoff 1-2 yrs. Ago = Layoff > 2 yrs. Ago	0,36	0,18	<0.01	0,35	<0.01	<0.01
P value for Wald Test Ho: Layoff last yr. = Layoff >2 yrs. Ago.	0,98	0,26	<0.01	<0.01	<0.01	<0.01
R²	0.37	0.37	0.18	0.18	0.15	0.15
N	32.762	32.762	32.743	32.743	32.872	32.872

Notes: The table reports coefficients of regressions of log hourly wages, an indicator of whether the person works in the formal sector, and tenure on the effective tariff in the current job and indicators of whether the person was laid-off from their previous job due a plant-closing during the past year, between 1 and 2 years ago and more than two years ago. Columns (2), (4), and (6) also interact these displacement dummies with the effective tariff dummy. All regressions control for city, sector and year effects, as well as age, education, and an indicator for whether the person is the household head. Robust standard errors are in parenthesis.

Table 5: Effects of Trade Liberalization and Bankruptcy Layoffs on Unemployment Durations

	(1)	(2)	(3)
Effective tariffs in last job	0.0298***	-0.0052	0.0605***
	(0.0021)	(0.0057)	(0.0092)
Bankruptcy layoff	0.2243**	0.2503**	0.2603**
	(0.1005)	(0.1005)	(0.1015)
Changed sectors		0.4039***	
		(0.1165)	
Changed sectors x Effective tariffs		0.0384***	
		(0.0060)	
Unemployment rate in current sector			0.0921***
			(0.0243)
Unemployment rate x Effective tariffs			-0.0025***
			(0.0007)
N	19.505	19.505	19.136

Notes: the table reports marginal effects from a Weibull model of the duration of unemployment on the effective tariffs in the previous job and on a dummy of whether the person was laid-off from their previous job due to a plant-closing. All models include city, sector, and year effects, as well as age, education and an indicator of whether the person is the household head. Column 2 also include and indicator of whether the person changed jobs and an interaction of this indicator with the effective tariff in the previous job. Column 3 also includes the current unemployment rate in the city and the interaction with the effective tariff in the previous job. Standard errors are in parenthesis.

Table 6: Descriptive Statistics for Household Head

	All	Above average tariff	Below average tariff	Bankruptcy Layoff	No Bankruptcy Layoff
Age	37,2352	36,3071	37,7462	38,8501	37,0527
	(9.9009)	(9.4355)	(10.1122)	(10.006)	(9.8726)
Fraction Female	0,1921	0,1584	0,2106	0,1986	0,1914
	(0.3939)	(0.3651)	(0.4077)	(0.3990)	(0.3933)
Years of Schooling	8,2410	7,9284	8,4131	7,9412	8,2748
	(4.2209)	(3.7843)	(4.4337)	(3.8928)	(4.2552)
Real Wage	4,893	4,458	5,132	4,205	4,970
	(9,254)	(8,338)	(9,713)	(5,412)	(9,588)
Household Income	1,501,104	1,367,246	1,574,804	1,351,376	1,518,024
	(2,132,745)	(1,994,172)	(2,201,953)	(1,506,692)	(2,191,677)
Probability of Formal Employment	0,5464	0,6057	0,5137	0,5257	0,5487
	(0.4978)	(0.4887)	(0.4998)	(0.4994)	(0.4976)
Tenure	2,6976	2,9609	2,5526	2,6736	2,7003
	(3.5284)	(3.7498)	(3.3918)	(3.4212)	(3.5404)
Unemployment Duration	3,3974	3,1499	3,5345	4,4896	3,2766
	(5.5412)	(5.2644)	(5.6844)	(6.1404)	(5.4578)
Effective tariff in current job	16,5540	24,4784	12,1908	17,1646	16,4849
	(9.6821)	(9.8567)	(6.1852)	(9.2778)	(9.7246)
Effective tariff in previous job	21,5375	29,2682	17,2812	23,8016	21,2817
	(17.0621)	(18.2142)	(14.7561)	(17.5072)	(16.9927)
Effective tariff in current job - Household average	16,5742	23,6562	12,6750	17,0895	16,5160
	(9.3038)	(10.4253)	(5.6183)	(8.9710)	(9.3392)
Fraction Laid-off due to Bankruptcy	0,1015	0,1159	0,0936	-	-
	(0.3020)	(0.3201)	(0.2912)	-	-
Number of household members	4,1186	4,1695	4,0906	4,2378	4,1052
	(1.7933)	(1.7952)	(1.7917)	(1.7956)	(1.7926)
Max N	15.571	5.529	10.042	1.581	13.990

Notes: the table reports means and standard deviations in parenthesis.

Table 7: Effects of Trade Liberalization and Bankruptcy Layoffs on Household Income

	(1)				(2)			
	Q_{20}	Q_{40}	Q_{60}	Q_{80}	Q_{20}	Q_{40}	Q_{60}	Q_{80}
Female-headed household	-0.1688***	-0.1978***	-0.1963***	-0.1870***	-0.2232***	-0.2542***	-0.2177***	-0.2273***
	(0.0147)	(0.0132)	(0.0182)	(0.0190)	(0.0313)	(0.0269)	(0.0417)	(0.0377)
Bankruptcy layoff	-0.0272	-0.0393**	-0.0603***	-0.0593***	-0.0294	-0.0382*	-0.0566**	-0.0585*
	(0.0172)	(0.0194)	(0.0226)	(0.0226)	(0.0195)	(0.0220)	(0.0228)	(0.0304)
Effective tariff in current job - Household average	0.0004	-0.0010	-0.0004	-0.0019	-0.0004	-0.0016	-0.0011	-0.0024
	(0.0012)	(0.0013)	(0.0013)	(0.0017)	(0.0015)	(0.0014)	(0.0017)	(0.0023)
Female-headed household x Effective tariffs					0.0035**	0.0032**	0.0014	0.0021
					(0.0014)	(0.0012)	(0.0025)	(0.0019)
N			15652				15652	

Notes: the table reports marginal effects from a quantile regression using quintiles of the distribution of household income on the average effective tariffs of all employed members in the household and an indicator of whether the household head was dismissed due to a plant-closing. The first specification in the first four columns includes city and year effects as well as age and education of the household head. The second specification in the last four columns also include an indicator for whether the head of the household is a woman and the interaction of this indicator with the average effective tariffs. Standard errors are in parenthesis.

Figure 1. Effective tarifffs and reform index, 1984-1998

Mean Effectis tarrifs

St. dev Effective tariffs

Reform index
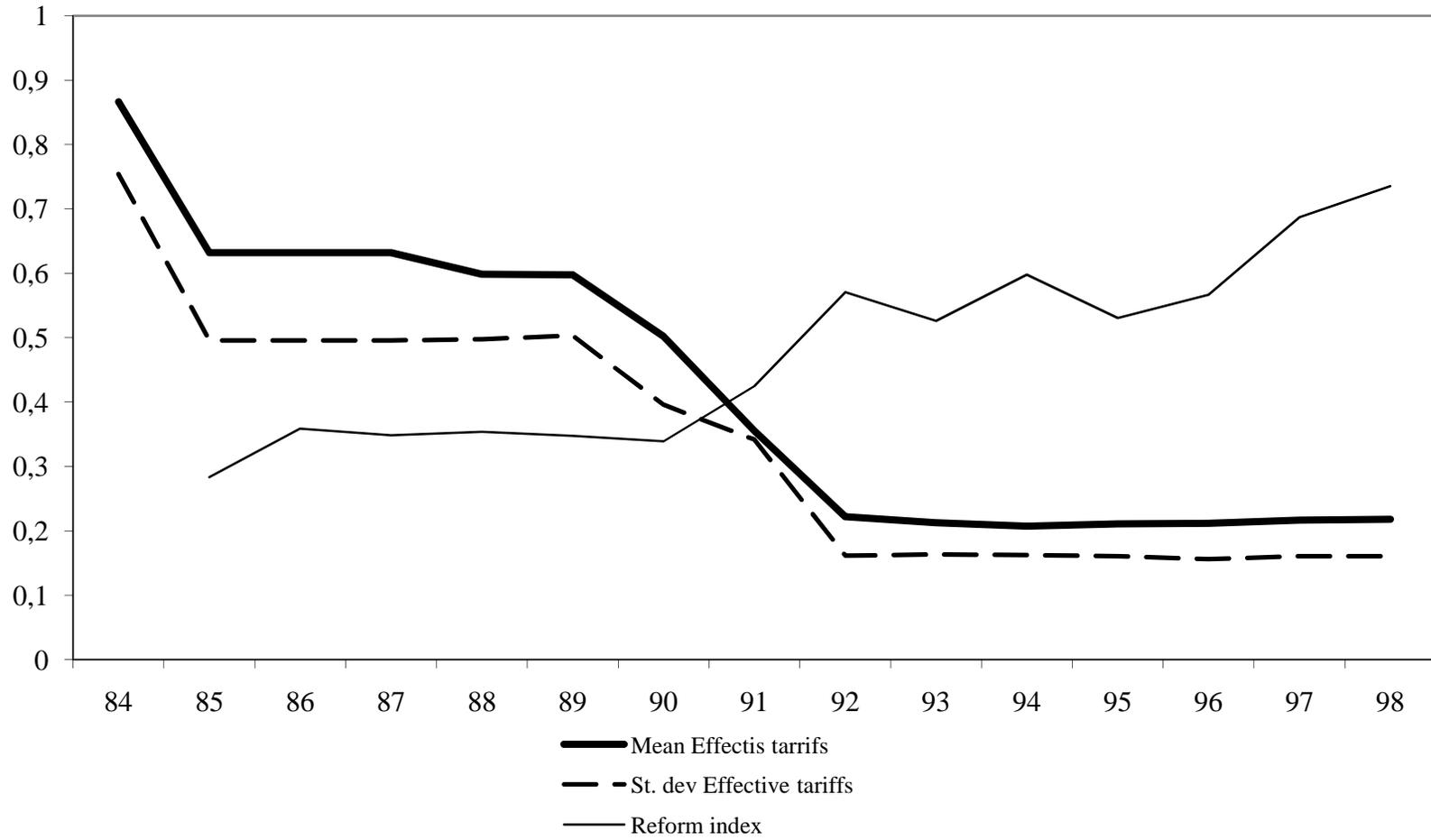
Figure 2. Effect of time since the person was laid-off due to bankruptcy on wage

Effect

0,4

0,3

0,2

0,1

0

-0,1

-0,2

-0,3

0   1   2   3   4   5   6   7   8   9   10 or more

Lag

——— Point estimates

--▲-- 95% confidence interval upper bound

--◆-- 95% confidence interval lower bound
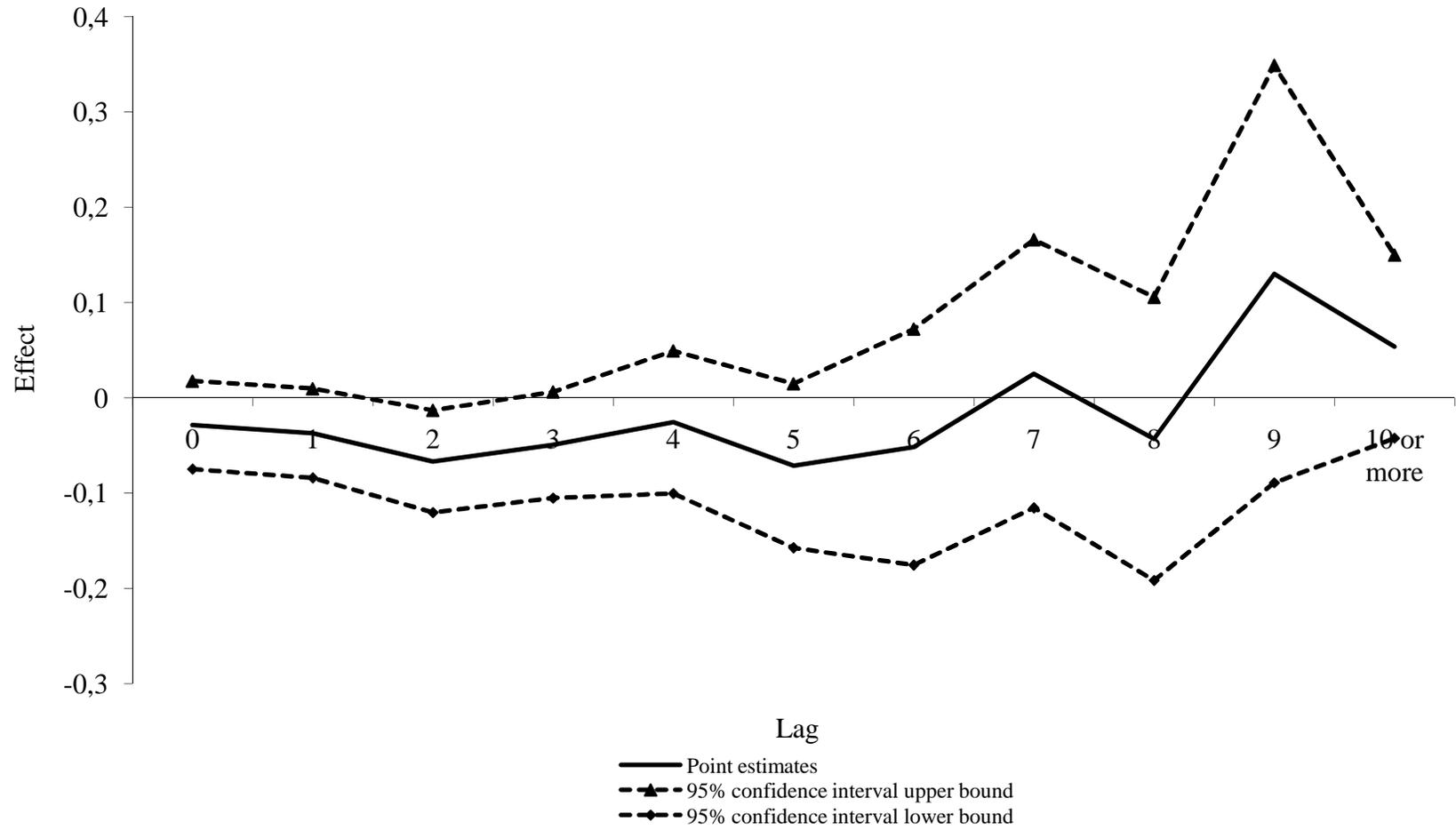
Figure 3. Effect of time since the person was laid-off due to bankruptcy on formality of employment

Point estimates
95% confidence interval upper bound
95% confidence interval lower bound

Lag
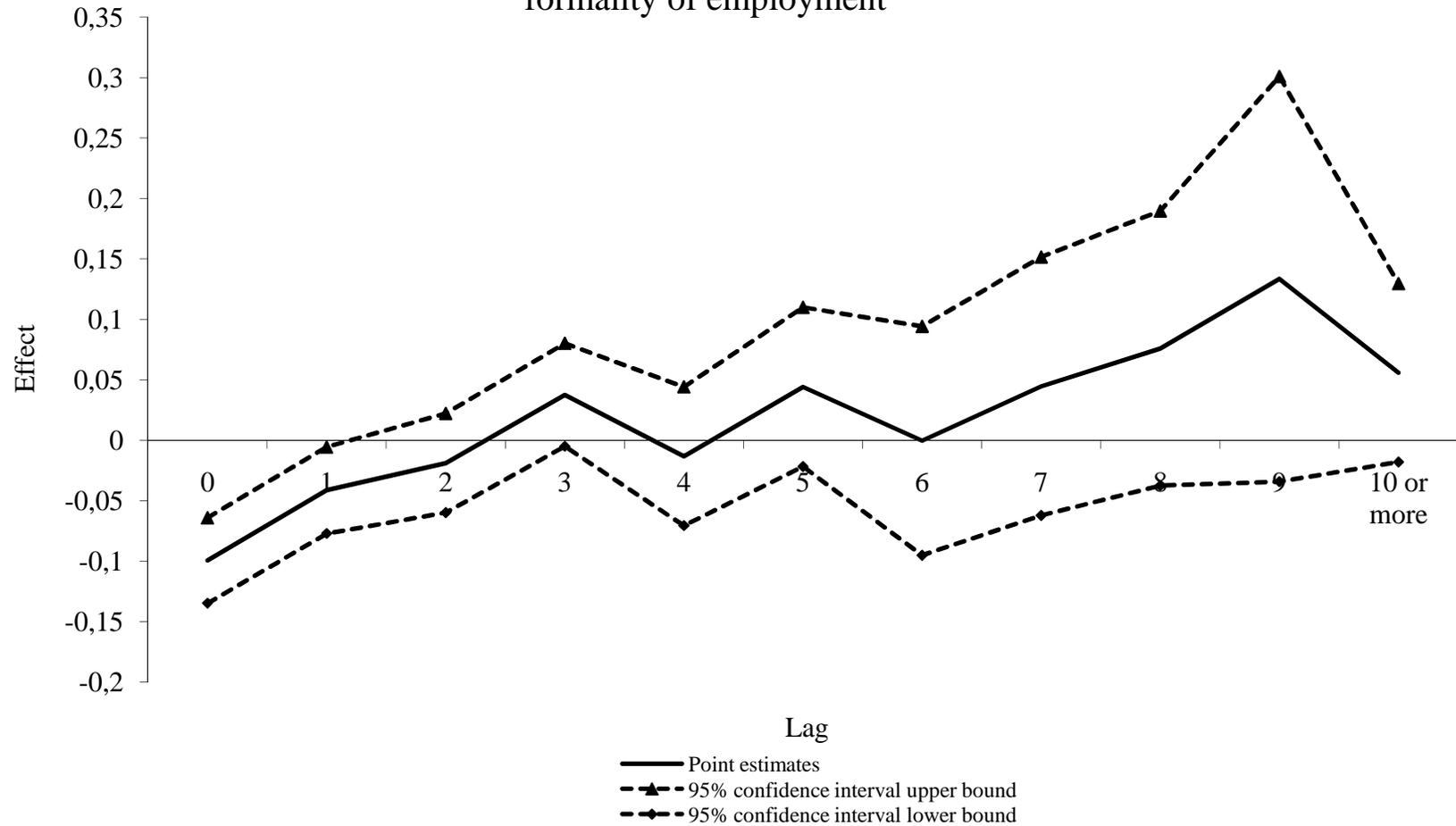
Figure 4. Effect of time since the person was laid-off due to bankruptcy on tenure