
Skill premia in Mexico: demand and supply factors

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Skill premia trends for the Mexican urban labour market are analysed, decomposing into demand and supply factors. Moreover, among the former both between and within effects are studied, in line with the Katz and Murphy decomposition. It is shown that demand factors are more important for explaining the initial increment in skill premia, but supply factors are responsible for driving them down. It is concluded that the North American Trade Agreement (NAFTA) favours unskilled labour.

I. Introduction

Mexico has experienced substantial changes in absolute and relative wages over the last two decades. Figures 1 and 2 present the trend followed by real absolute wages, distinguishing five educational categories (primary, incomplete and complete high school, and incomplete and complete college) and gender. We observe that the gains obtained during the first half of the decade were dramatically lost at the 1995 (*Tequila*) crisis. Moreover, unskilled workers suffered significantly more the decline, although this group also showed an extraordinary rate of growth at the end of the decade. Overall, only women with complete college education have in 2003 a higher real wage than in 1991. Figures 3 and 4 present the evolution of skill premia for *high school* and *college* relative to *primary* workers, and *college* relative to *high school* by gender. Clearly we distinguish two subperiods: 1990–1995, with increasing premia, and 1996–2003, with a declining trend.

This paper explains the evolution of skill premia in Mexico in a simple relative demand and supply framework using the Katz and Murphy (1992) method.

Our purpose is to distinguish what proportion can be accounted by demand and supply factors, and among the former what corresponds to the effects of trade, technological change and political reforms (deregulation, privatization, etc.). Similar approaches have been successfully used to understand the evolution of skill premia (see the Choi and Jeong, 2005 analysis for Korea, and Dupuy and Borghans, 2005, for a recent cross-country application) and it contributes to the understanding of the effect of trade liberalization on inequality (see, for instance, Carneiro and Arbache, 2003 for Brazil).

The empirical literature on the subject has concentrated on the increase in the skill premia and inequality that occurred before and right after the North American Trade Agreement (NAFTA) (Cragg and Epelbaum, 1996; Revenga, 1997; Feenstra and Hanson, 1997; Pagán and Tijerina-Guajardo, 2000) and consensus has emerged about the effect of trade liberalization: trade expansion and tariff reductions were responsible for the increase in premiums. Pagán and Tijerina-Guajardo (2000) found that most of the increase in overall wage dispersion was within the formal sector and that a significant compression

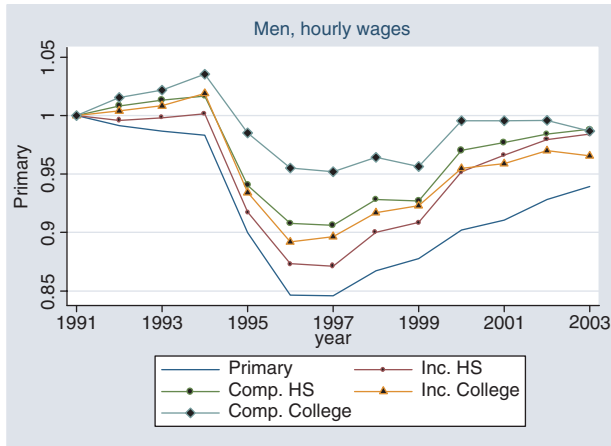


Fig. 1. Evolution of absolute wages – men

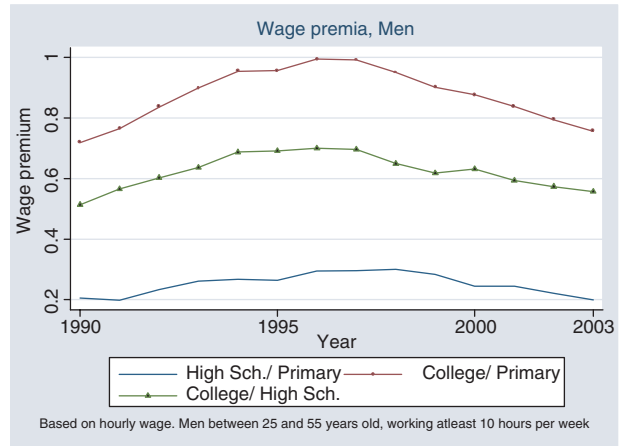


Fig. 3. Evolution of skill premia – men

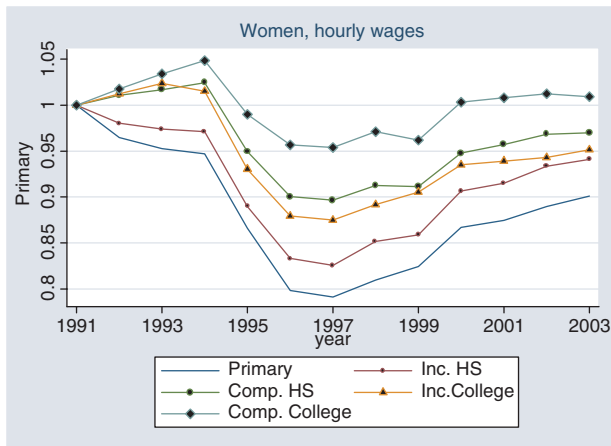


Fig. 2. Evolution of absolute wages – women

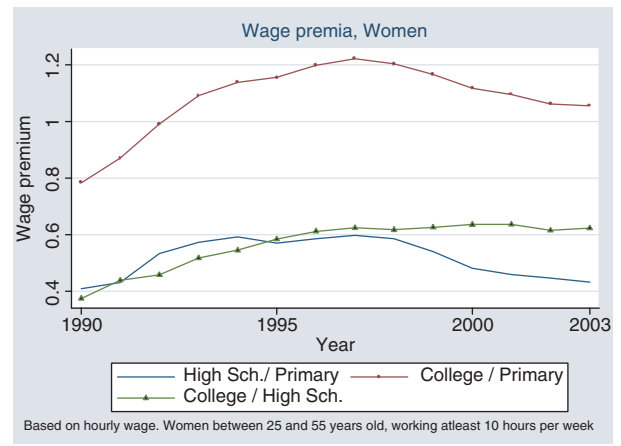


Fig. 4. Evolution of skill premia – women

occurred in the wage distribution of the informal sector. Feenstra and Hanson (1997) and Love and Hidalgo (2000) studied the impact of foreign direct investment, and the former concluded that those investments can account for more than 50% of the initial increase in wage inequality. However, from 1997, skill premia have declined and few empirical studies acknowledged it (Robertson, 2004).

This topic may be useful to extrapolate to other developing countries which analyse reducing trade barriers with respect to developed countries, as Mexico did with NAFTA. Moreover, this approach has a pedagogical purpose, since no other paper in the literature has documented the supply and demand trends in an integrated framework for the Mexican labour market.

This paper is organized as follows. Section II briefly describes the data. Section III summarizes the evolution of absolute and relative wages, and gives

some useful decompositions that motivate the subsequent analysis. Section IV discusses the effect of supply factors and Section V the effect of demand factors. Finally, Section VI gives conclusions and suggestions for future research.

II. Data Description and Stylized Facts

Labour market information comes from the Encuesta Nacional de Empleo Urbano (ENEU) which provides household surveys of considerable size for almost all Mexican states for the period 1987–2003. Since this survey appears quarterly we will take only the second quarter of each year. Nominal wages are deflated using the general INEGI price index. We restrict the sample to individuals between 20 and 65 years old. In the sections below we restrict our attention to men,

Table 1. Evolution of absolute wages, between and within decomposition

Education	Exp.	1991–1995			1995–1999			1999–2003		
		Overall	Between	Within	Overall	Between	Within	Overall	Between	Within
<i>Primary</i>	< 5	-0.378	0.062	-0.440	-0.020	0.026	-0.046	0.380	0.112	0.268
	5–9	-0.263	0.042	-0.305	-0.020	0.024	-0.044	0.188	-0.102	0.290
	10–15	-0.144	0.127	-0.271	-0.073	-0.043	-0.030	0.225	-0.039	0.264
	15–20	-0.232	0.040	-0.271	-0.048	0.016	-0.064	0.202	-0.051	0.253
	> 20	-0.223	0.063	-0.285	-0.108	-0.014	-0.094	0.214	-0.012	0.226
<i>Inc.HS</i>	< 5	-0.308	0.058	-0.366	-0.148	-0.101	-0.047	0.343	0.059	0.284
	5–9	-0.193	0.036	-0.230	-0.103	-0.047	-0.056	0.303	0.039	0.264
	10–15	-0.138	0.093	-0.231	-0.003	0.021	-0.024	0.125	-0.095	0.220
	15–20	-0.238	-0.039	-0.200	-0.070	-0.018	-0.052	0.210	-0.011	0.222
	> 20	-0.163	0.083	-0.246	-0.072	0.009	-0.081	0.111	-0.080	0.191
<i>Comp.HS</i>	< 5	-0.277	-0.013	-0.264	-0.157	-0.097	-0.061	0.260	0.032	0.228
	5–9	-0.192	0.051	-0.243	-0.072	-0.065	-0.007	0.230	0.020	0.210
	10–15	-0.177	0.009	-0.186	-0.123	-0.063	-0.060	0.231	0.041	0.191
	15–20	-0.171	-0.029	-0.142	-0.032	0.054	-0.085	0.215	0.001	0.214
	> 20	-0.260	-0.068	-0.192	-0.144	0.000	-0.144	0.133	-0.034	0.167
<i>Inc.College</i>	< 5	-0.208	0.088	-0.296	-0.145	-0.106	-0.040	0.216	0.049	0.168
	5–9	-0.154	-0.016	-0.138	0.005	0.061	-0.055	0.109	-0.040	0.149
	10–15	-0.203	0.008	-0.210	-0.094	-0.067	-0.027	0.105	-0.049	0.154
	15–20	-0.268	-0.001	-0.267	-0.110	-0.040	-0.070	0.178	0.024	0.154
	> 20	-0.130	0.031	-0.161	-0.236	-0.021	-0.215	0.151	0.001	0.150
<i>Comp.College</i>	< 5	-0.137	-0.038	-0.099	-0.067	0.030	-0.097	0.151	0.010	0.140
	5–9	-0.005	0.054	-0.060	-0.112	-0.001	-0.111	0.199	0.024	0.175
	10–15	0.010	0.074	-0.064	-0.174	-0.052	-0.122	0.129	-0.003	0.132
	15–20	-0.130	-0.037	-0.092	-0.171	0.009	-0.180	0.091	-0.044	0.135
	> 20	-0.071	-0.041	-0.031	-0.160	0.028	-0.188	0.055	-0.089	0.144

Note: Men who work at least 10 hours per week and receive monetary compensation.

but similar results for women are available upon request from the author.

III. Evolution of Absolute and Relative Wages

Absolute wages

Following Bound and Johnson (1992) we could apply a useful decomposition to the changes in wages. Any variation could be either because of omnipresent changes in wages (i.e. a decline in the general level of wages), or by differences in the participation of a certain group by industry (i.e. reallocation of resources). We call the former within effect (WI) while the later is the between effect (BE). More formally, let k and j denote skill group and industry respectively. Then we have

$$\Delta w_{k,t} = w_{k,t} - w_{k,t-1} = \sum_j \alpha_{jk,t} (w_{kj,t} - w_{kj,t-1}) + \sum_j w_{kj,t-1} (\alpha_{jk,t} - \alpha_{jk,t-1})$$

where w denotes wages, $\alpha_{jk} = E_{jk}/E_k$ is the share of workers of group k who work in industry j , and E denotes employment levels. Thus, define the *within* change as the first term, while naturally the *between* change is the latter term.

Table 1 presents the decomposition for the subperiods 1991–1995, 1995–1999, 1999–2003, for men by education and experience categories. The first period is characterized by predominant WI changes for all except workers with college education. The fall in wages for the first half of the decade is bigger for younger and less skilled workers. Note that BE have in general the opposite sign, which reflects the fact that workers move towards sectors that pay relatively more for their individual skills. However, the last period is the negative image of the first one: the increment in wages is greater for low-skill workers for all levels of experience. Note that BE account for a greater portion of the change when we analyse the last two periods. This effect is especially big for young workers, who may be able to easily move across industries.

Table 2. Evolution of skill premia

Education	Exp.	1991–1995			1995–1999			1999–2003		
		Overall	Between	Within	Overall	Between	Within	Overall	Between	Within
<i>Inc.HS</i>	< 5	0.017	0.098	-0.081	-0.053	-0.002	-0.051	-0.124	0.007	-0.131
	5–9	0.034	0.091	-0.057	-0.040	-0.021	-0.019	0.115	-0.014	0.129
	10–15	0.006	0.024	-0.018	0.070	0.020	0.050	-0.100	-0.047	-0.054
	15–20	-0.007	0.067	-0.073	-0.022	0.004	-0.026	0.009	-0.025	0.034
	> 20	0.059	0.026	0.033	0.036	-0.001	0.037	-0.103	-0.043	-0.060
<i>Comp.HS</i>	< 5	0.040	0.223	-0.183	-0.162	-0.011	-0.151	-0.133	-0.072	-0.062
	5–9	0.014	0.069	-0.055	-0.002	0.025	-0.028	0.042	-0.055	0.097
	10–15	-0.033	0.036	-0.069	-0.050	0.001	-0.050	0.006	-0.073	0.079
	15–20	0.063	0.099	-0.036	0.017	-0.033	0.050	0.013	-0.032	0.045
	> 20	-0.037	0.061	-0.099	-0.036	-0.076	0.040	-0.081	-0.059	-0.022
<i>Inc.College</i>	< 5	0.077	0.200	-0.123	-0.076	0.024	-0.101	-0.211	-0.182	-0.028
	5–9	0.115	0.187	-0.072	0.019	-0.037	0.056	-0.079	-0.112	0.033
	10–15	-0.059	-0.005	-0.053	-0.021	0.046	-0.067	-0.121	-0.112	-0.009
	15–20	-0.037	-0.027	-0.010	-0.062	-0.019	-0.043	-0.024	-0.086	0.062
	> 20	0.093	0.097	-0.004	-0.128	-0.146	0.018	-0.063	-0.072	0.009
<i>Comp.College</i>	< 5	0.192	0.391	-0.199	-0.105	-0.029	-0.076	-0.253	-0.302	0.048
	5–9	0.241	0.248	-0.007	-0.096	-0.096	0.000	0.011	-0.070	0.081
	10–15	0.154	0.073	0.081	-0.101	0.008	-0.109	-0.096	-0.136	0.040
	15–20	0.102	0.098	0.004	-0.122	-0.119	-0.004	-0.111	-0.094	-0.017
	> 20	0.151	0.192	-0.041	-0.052	-0.141	0.090	-0.159	-0.060	-0.099

Notes: With respect to *primary* workers. Men who work at least 10 hours per week and receive monetary compensation.

Relative wages

Wage premium changes can also be decomposed into *within* and *between* effects. Let k and h denote two groups of interest. Then the change in the wage premium of k vs. h can be expressed as

$$\Delta w_{k,t} - \Delta w_{h,t} = \sum_j \alpha_{jk,t} (\Delta w_{kj,t} - \Delta w_{hj,t}) + \sum_j (\alpha_{jk,t} - \alpha_{jh,t}) \Delta w_{hj,t}$$

where $\alpha_{jk} = E_{jk}/E_k$ the share of industry j employment with respect to group k . As before, we will call *within* the first term and *between* the second.

Table 2 shows the premium changes for the same subperiods considered above. For the period 1991–1995 we observe the increase in inequality that was predicted in Figures 3 and 4. WI and BE decompositions have opposite signs, which may indicate that different factors are occurring at the same time. On the one hand, positive BE reflects the fact that differences in the distribution of employment are important: the biggest increase in wages occurred in sectors where workers with primary education were not predominant. On the other hand, within the same sector low-skill workers have a positive effect. This may be the result of biased technological change.

A similar pattern is repeated in the subsequent periods, making the overall change favourable to low-skill workers as BE become weaker. Notice that the skill premium is increasing in education for the first period, but decreasing during the latter. In terms of experience, the pattern described above is clearer for younger workers. In general, as we move toward more experienced categories the tendency diffuses.

IV. Supply Factors

Education has markedly increased over the period of analysis. Figures 5 and 6 present the relative supply of *high school* and *college* workers with respect to *primary workers*, as well as the ratio *college/high school*, separating by gender. As we noted earlier, workers with *high school* and *college* as a proportion of *primary* workers is increasing over the whole period. The exception to the tendency is given for the periods immediately after the crisis, which is determined by an expansion of the employment rate. For men, we observe that the ratio of *high school* to *college* is actually decreasing, while for women it shows a weak growth rate. However, different causes may have been driving women's labour supply

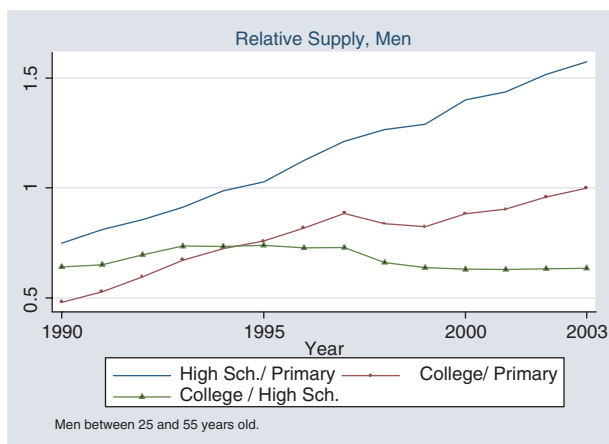


Fig. 5. Evolution of relative supply – men

behaviour. For instance, Parker and Skoufias (2004) have shown that Mexican women increase their labour supply in response to their husband's unemployment.

In terms of relative wages, the pattern followed by the labour supply had a positive impact on the incomes of the less skilled workers. The significant decline that occurred after 1997 in the premia may be the result of the relative supply increment. The same period is associated with the fastest wage growth rate for men with *primary* education. However, the fact that for the first half of the 1990s, skill premia and relative supply are positive correlated indicates that other factors were affecting the relative wages. Nevertheless, the small number of years considered and the significant economic changes make it difficult to quantify supply effect.

V. Demand Shift Indices

As a first approximation to the demand side of the labour market, consider the employment shares by industry presented in Table 3. Despite the extraordinary changes in wages, employment was relatively stable over the whole period of analysis. Harrison and Hanson (1999) show that the sluggish employment response to changes in output is explained by the fact that firms cut profits and wages considerably, although they found great variation between and within industries. On the other hand, Roberston and Dutkowsky (2002) show that inter-industry variation in adjustment responses

¹We consider ten industries and four occupation categories: managers and professionals, white collars, blue collars and salesmen.

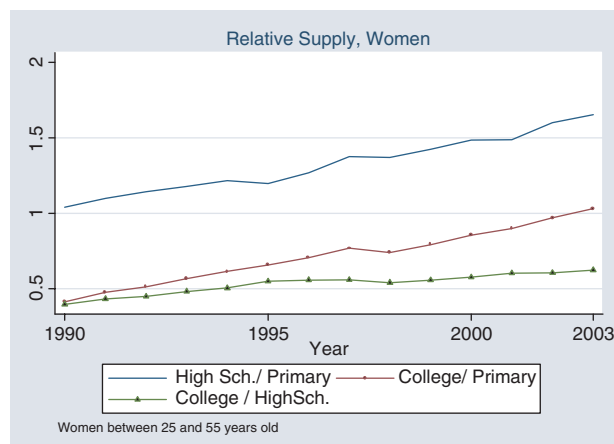


Fig. 6. Evolution of relative supply – women

can be explained by institutional factors, such as unionization and training.

The evolution of skill premium seems to be highly correlated with demand shocks. The extent to which the two phases of increasing and decreasing skill premium can be associated to pre- and post-NAFTA periods is informative.

In order to systematically study the changes in demand we follow Katz and Murphy (1992) demand shifts index. Those authors distinguish *overall*, *between* and *within* demand shifts (OV, BE and WI respectively). The causes for the second include shifts in product demand across industries, differences in factor-neutral total factor productivity and net international trade effects. The latter comes from 'outsourcing' (shifts of portions of employment in and out the country), non-neutral technological change and changes in the prices of non-labour inputs. Since both BE and WI could be considered theoretically exclusive, the OV change is just given by the sum of the two.

Let E_k denote employment of group k in a certain period, E_j denote total employment in sector j and E_{jk} denote employment of group k in sector j . (All employment measures are normalized to sum to one in each period and are measured in efficiency units.)

Then, we define the demand shift index of group k as:

$$\Delta X_k^d = \sum_j \left(\frac{E_{jk}}{E_k} \right) \left(\frac{\Delta E_j}{E_j} \right)$$

Following Katz and Murphy we define OV shift when j denotes all industry and occupation¹ cells.

Table 3. Employment by sectors of economic activity

	1991	1995	1999	2003
<i>Employment trends</i>				
Agriculture and Mining	1.00	0.95	0.83	1.55
Manufacture	1.00	0.89	1.03	0.86
Construction	1.00	0.99	0.92	1.03
Utilities and Transportation	1.00	0.95	0.96	0.95
Commerce	1.00	1.05	1.01	1.10
Financial Services	1.00	0.87	0.66	0.57
Health, Education, Public Administration	1.00	1.04	1.01	1.05
Personal Services	1.00	1.12	1.05	1.03
<i>Employment shares</i>				
Agriculture and Mining	2.1%	1.9%	1.6%	2.9%
Manufacture	26.7%	23.8%	27.5%	23.0%
Construction	6.3%	6.2%	5.7%	6.5%
Utilities and Transportation	6.7%	6.4%	6.4%	6.3%
Commerce	23.4%	24.6%	23.7%	25.8%
Financial Services	2.0%	1.7%	1.3%	1.1%
Health, Education, Public Administration	19.8%	20.6%	20.1%	20.9%
Personal Services	13.1%	14.7%	13.8%	13.5%
<i>Wages</i>				
Agriculture and Mining	1.00	0.86	0.78	0.75
Manufacture	1.00	0.93	0.93	1.01
Construction	1.00	0.93	0.90	1.01
Utilities and Transportation	1.00	0.95	0.94	1.01
Commerce	1.00	0.90	0.88	0.97
Financial Services	1.00	1.02	0.97	1.01
Health, Education, Public Administration	1.00	1.00	0.98	1.04
Personal Services	1.00	0.89	0.86	0.99

When j indexes only industries we get BE indexes. The difference is called WI, since we may think of occupations as producing intermediate goods within industries. Other studies (Cragg and Epelbaum, 1996) have shown that return to occupation explains half of the growing wage dispersion. This supports the idea that the rapid pace of change in the economy might increase the demand for individuals that enact the change: i.e. managers and professionals. Moreover, the probability of changing the quality of the occupation could be assumed to increase with education and experience, and therefore we expect that it should have a negative impact on unskilled workers.

Table 4 reports the estimated demand shifts for the periods 1991–1995, 1995–1999 and 1999–2003. It is clear that it closely follows the pattern of the skill premia. That is, for the subperiod 1991–1995, which has a steady increase in the premia, we observe a positive demand index for college educated workers and a negative demand for non-college workers. On the other hand, the trend is increasing in experience, i.e. workers with more experience show a relative increase in their wage. Following Katz and Murphy, greater explanatory power of the WI indexes reflects the importance of non-neutral technological change and changes in

input prices complementary to college workers. Moreover, the negative effect of BE indexes on low-skill workers may reflect the fact that massive economic shocks hurt this group in particular.

The next period of analysis (1995–1999) shows that virtually all the demand action comes through WI shifts. In this case, the sign is reversed, favouring low-skilled workers over high-skilled ones. Finally, the new millennium relatively favoured low-skilled workers. This may be the result of new low-skill biased technology adoption.

The fact that also BE significantly contributes to demand shifts in the last period, is concatenated to the idea that NAFTA is especially pro-unskilled. In other words, trade openness with the USA may have caused a demand shift towards low-skilled workers, which in turn decreased inequality. This change was caused by promotion of industries in the tradable sector.

VI. Conclusions and Suggestions for Future Research

We have analysed the evolution of skill premia using a simple relative demand and supply framework. Our

Table 4. Katz and Murphy (1992) demand shift indices

Education	Exp.	1991–1995			1995–1999			1999–2003		
		Overall	Between	Within	Overall	Between	Within	Overall	Between	Within
<i>Primary</i>	< 5	-0.057	-0.020	-0.037	0.011	-0.007	0.018	0.053	0.050	0.003
	5–9	-0.113	-0.051	-0.062	0.024	0.000	0.024	0.031	0.026	0.005
	10–15	-0.096	-0.033	-0.063	0.022	0.000	0.022	0.027	0.022	0.005
	15–20	-0.093	-0.035	-0.058	0.019	-0.002	0.022	0.029	0.024	0.005
	> 20	-0.060	-0.009	-0.051	0.010	-0.009	0.019	0.054	0.050	0.004
<i>Inc.HS</i>	< 5	-0.082	-0.029	-0.053	0.026	0.008	0.019	0.006	0.004	0.001
	5–9	-0.089	-0.045	-0.044	0.028	0.011	0.017	-0.014	-0.015	0.001
	10–15	-0.087	-0.047	-0.040	0.026	0.011	0.014	-0.014	-0.015	0.001
	15–20	-0.071	-0.043	-0.028	0.023	0.008	0.015	-0.014	-0.013	0.000
	> 20	-0.033	-0.025	-0.007	0.017	0.008	0.009	-0.012	-0.011	-0.002
<i>Comp.HS</i>	< 5	-0.038	-0.030	-0.007	0.008	0.007	0.002	-0.012	-0.011	-0.001
	5–9	-0.016	-0.025	0.008	0.006	0.009	-0.003	-0.024	-0.020	-0.005
	10–15	0.000	-0.034	0.035	0.006	0.009	-0.003	-0.024	-0.019	-0.004
	15–20	0.025	-0.004	0.029	-0.005	0.003	-0.008	-0.025	-0.024	-0.002
	> 20	0.077	0.009	0.068	-0.014	0.000	-0.014	-0.016	-0.013	-0.003
<i>Inc.College</i>	< 5	0.033	0.006	0.027	-0.007	0.001	-0.009	-0.016	-0.013	-0.003
	5–9	0.023	-0.023	0.046	-0.016	-0.002	-0.014	-0.022	-0.019	-0.003
	10–15	0.016	-0.021	0.036	-0.009	0.008	-0.017	-0.028	-0.024	-0.004
	15–20	0.035	-0.009	0.045	-0.016	0.002	-0.018	-0.018	-0.017	-0.002
	> 20	0.081	-0.006	0.087	-0.013	0.008	-0.021	-0.014	-0.012	-0.002
<i>Comp.College</i>	< 5	0.126	0.014	0.112	-0.050	-0.005	-0.045	-0.020	-0.015	-0.006
	5–9	0.142	0.026	0.117	-0.053	-0.002	-0.051	-0.025	-0.018	-0.007
	10–15	0.138	0.031	0.107	-0.044	-0.001	-0.043	-0.016	-0.013	-0.003
	15–20	0.154	0.033	0.121	-0.048	-0.005	-0.044	-0.012	-0.008	-0.003
	> 20	0.178	0.058	0.120	-0.048	-0.004	-0.044	-0.001	-0.003	0.002

Note: Men who work at least 10 hours per week and receive monetary compensation.

findings show that skill premia decreased after the Mexican crisis of 1995, and this can be attributed both to NAFTA and to supply shocks. The between and within decompositions proved to be useful in understanding the evolution of relative wages although additional research is needed to understand the causes of these effects.

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