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Skill Premium in Chile: Studying Skill Upgrading in the South

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Summary. — I study whether the evolution of the relative demand for skilled workers is a consequence of international transmission of skill upgrading technologies from developed countries (in particular the US) to developing ones. Using data for Chile from 1960 to 2000, I present sectoral and macro evidence consistent with this hypothesis and that does not support alternative hypotheses related to trade theories emphasizing the role of price effects, trade in intermediate goods and outsourcing, or competition effects in tradable markets.

Key words — wage premium, skill upgrading, trade openness, skill biased technical change, Chile, Latin America

1. INTRODUCTION

The evolution of the skill premium (i.e., the wage differential between skilled and unskilled workers) has interest from at least two perspectives: it is a rough measure of inequality among workers of different qualifications and provides information on the characteristics of the development process of the economy (in particular, how globalization may affect the evolution of the demand and supply of skilled workers). In this regard, Chile is a particularly interesting case of study because it corresponds to a small open economy that has undergone a significant change in its economic structure over the last 40 years. Moreover, Sánchez-Páramo and Schady (2003) document that the evolution of skill upgrading in Chile is representative of the evolution of other countries in Latin America. Therefore, the detailed study of the case of Chile is also relevant to understand the evolution of other emerging and developing countries.

The skill premium in Chile has increased significantly from about 140% in the 1960s to an average of 230% and 250% in the 1980s and 1990s, respectively (Figure 1). [1] In turn, the relative supply of skilled workers increased significantly over the same period: the ratio of college graduate equivalents to high-school graduate equivalents has increased from 0.14 in the 1960s to 0.21 and 0.31 over the 1980s and the 1990s, respectively (Figure 2). In addition, I estimate that most of the skill upgrading corresponds to a within sector phenomenon (i.e., skill upgrading took place in most sectors of the economy). This suggests that the relative demand for skilled workers has increased significantly in the latter period in most sectors of the economy. [2]

The literature on the subject for the case of developing economies tends to emphasize the effects of globalization and reforms such as trade openness on wage differentials but the results are controversial (see Goldberg & Pavnick, 2007 for a detailed discussion). In this paper, I test using both micro and macro evidence the hypothesis that a non-trivial part of the evolution of the demand for skilled workers in Chile is due to the diffusion of skill-biased technologies from developed countries, in particular from the US. [3] As a motivation, Figure 4 presents the evolution of the wage premium in the US and the demand for skilled workers in Chile. [4] As this Figure shows, movements in the skill premium in the US seem to be correlated with movements in the relative demand for skilled workers in Chile over most periods. In particular, the big increase in the relative demand in the mid 1980s—the period when skill upgrading was stronger in Chile when the annual growth of the relative demand for skilled workers increased from 3.7% in 1985–75 to 7.2% in 1985–90—occurs at the same time as the big increase in the wage premium in the US (as documented by, for instance, Acemoglu & Autor, 2011).

With this correlation as a motivation, the econometric estimates of my paper provide macro and sectoral evidence of a close relationship between patterns of skill upgrading in the US and Chile. My sectoral evidence also suggests that the correlation between skill-upgrading in both countries is bigger in both tradable and non-tradable sectors that are highly intensive in imported capital, thus confirming the potential role of international transmission of patterns of skill upgrading from developed to emerging countries. Results are for the most part robust to controls for changes in tariffs and in foreign direct investment (FDI) at the sectoral level. My time series estimates present evidence that, controlling for other factors, there is a positive and economically and statistically significant correlation between the wage premium in the US and skill upgrading in Chile. I discard spurious correlation by presenting a number of exercises including both specifications in level and first differences, a Granger-causality test, and by including a number of controls for other economic variables.

From a theoretical perspective, the study of the relationship between skilled upgrading in developing and developed countries is not new in the literature. I argue that this correlation may be explained by models that emphasize the international transmission of technologies embodied in machines produced in developed countries (e.g., Acemoglu, 2003), models that

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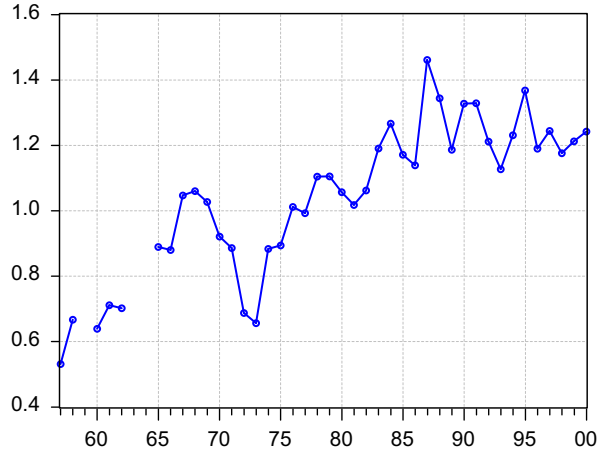

Figure 1. *The wage premium in Chile. Source: Author's calculations using the University of Chile employment survey. See the main text for details.*

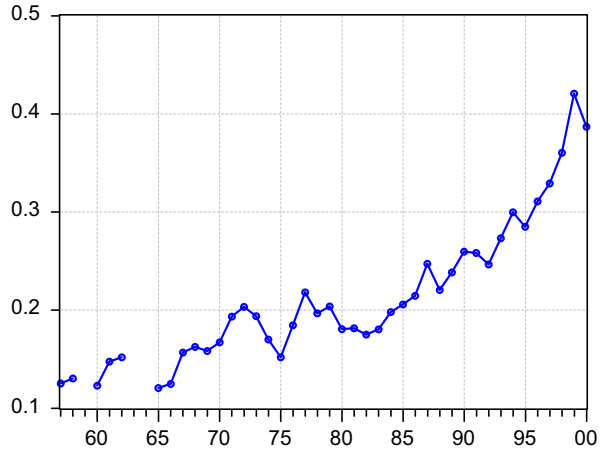

Figure 2. *Relative supply in Chile. Source: Author's calculations using the University of Chile employment survey. See the main text for details.*

emphasize the potential role of outsourcing and the international fragmentation of production (e.g., Feenstra & Hanson, 1996, 1997, 2003; Hsieh & Woo, 2005), models that stress the effects of competition in tradable markets and their influence on technology choices in both developed and developing countries (e.g., Bernard and Jensen, 1997; Matsuyama, 2007; Melitz, 2003; Stokey, 1996; Verhoogen, 2008), or models that emphasize Stolper–Samuelson effects. I present some tests to try to disentangle among these alternative theoretical explanations. I present sectoral evidence suggesting that the correlation between skill upgrading exists in both tradable and non-tradable sectors, implying that theories that relate skill-upgrading with outsourcing or the skill-intensity of tradable activities cannot alone explain the data for Chile. Moreover, I show that the patterns of skill upgrading are stronger in sectors with more imports of machinery and equipment which is coherent with theories that emphasize the international transmission of technologies. In my time series estimates I control for proxies of the different explanations and find that trade-related theories cannot explain the correlation between the skill premium in the US and the relative demand for skilled workers in Chile. This is an important contribution of this paper to the existing literature.

I extend the empirical research on the relationship between skill upgrading in developed and developing countries in three additional dimensions. First, I distinguish both conceptually and empirically between the range of different mechanisms for the international transmission of skill premia. In particular, I suggest a number of empirical implications of the different theories that allow me to test whether they are consistent with the empirical regularities.

Second, I extend previous studies that present positive correlations of skill upgrading at the sectoral level for manufacturing sectors for one specific cross-section using sectoral data (Berman & Machin, 2000; Berman *et al.,* 1998, and Sánchez-Páramo & Schady, 2003) by including (i) sectors outside manufacturing, (ii) data from a longer span of time (1960–2000), and, more importantly, (iii) using a unique panel dataset at the sectoral level which allows me to control for time and sector specific effects. To my knowledge, no other paper has studied directly this correlation using information within sectors of the same country for a long period of time. [5]

Third, I explicitly study the correlation between the wage premium and skill upgrading in a developed country (the USA) and a developing country (Chile), controlling for other determinants of skill upgrading, using macro time series econometrics. While some papers have implemented time series analyses of the wage premium in emerging countries (e.g., Beyer, Rojas, & Vergara, 1999), to my knowledge this is the first paper that correlates proxies for and determinants of skill upgrading in a developed country with the evolution of skill upgrading in developing countries.

The related empirical literature also includes several studies for Chile and other developing countries. [6] For the case of Chile, Robbins (1994a) and Gindling and Robbins (2001) argue that the increase in the relative demand for skilled workers is related to trade openness and, in particular, to technology transfers from abroad, which is also emphasized by Pavcnik (2000) and Sánchez-Páramo and Schady (2003). The basic finding of this literature is a correlation between variables such as imports of capital goods or the FDI stock and skill upgrading at the micro level. Some evidence, however, contradicts these explanations. First, Robbins (1994a) and Gindling and Robbins (2001) focus the analysis on the 1975–90 period, but the big increase in the relative demand for skilled workers takes place only since the mid 1980s, while trade openness increases significantly in the 1970s. Second, the evidence on the role of technology transfers has no clear causal interpretation. It may well be the case that some sectors have a higher demand for skilled workers and for equipment capital because of a third (omitted) variable. Recent evidence in Fuentes and Gilchrist (2004) and Pavcnik (2003) present conflicting evidence using the same plant-level dataset in the manufacturing sector for two different time periods. While the first paper presents evidence of a positive correlation between skill upgrading and proxies for technology transfers, the second paper using a shorter period find no correlation among the two dimensions. As I argue below this conflicting evidence can be due to the fact that it is assumed that all technology transfers have the same bias toward skilled workers. In fact, skill upgrading has varied a lot in different periods in the US and other countries—and actually there is evidence that in some historical periods technologies have become biased in favor of unskilled workers (see Acemoglu & Autor, 2011 for more details).

Finally, even though a literal interpretation of my results is about correlation between skill upgrading in the US and Chile, I interpret my results as a correlation between skill upgrading in developed countries and Chile. The basic evidence supporting this idea is three-fold: (i) a high correlation between skill upgrading at the sectoral level in all high income countries, as documented in Berman *et al.* (1998), (ii) a high share of