Export Shocks and the Volatility of Returns to Schooling

Evidence from Twelve Latin American Economies

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Abstract

This paper builds on previous studies to uncover evidence suggesting that cyclical fluctuations in returns to schooling are determined by fluctuations in foreign demand, which tend to be positively correlated with returns to schooling. The effect of export fluctuations (driven by changes in foreign demand) seems to be attenuated by labor market rigidities, such as constraints on employers to hire temporary workers on an hourly basis. This evidence suggests that countries that have flexible labor markets and experience volatility in their external demand might also experience volatility in returns to schooling. The paper discusses why this might be a concern for developing countries.
Export Shocks and the Volatility of Returns to Schooling:
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1. Introduction

A well-documented feature of the 1990s is the decline in the wages of unskilled workers relative to those of skilled workers. This observation is valid for both developed and developing countries and it has been associated with the trade reforms of the late 1980s and 1990s. In order to explain this evidence, some hypotheses that relate the skill premium to trade have been proposed. For instance, it has been pointed out that skill-biased technological change, the increase in capital flows and the increase in outsourcing activities (or “global production sharing”) help to explain the relationship between trade reforms and income inequality in the long run.

There is less evidence, however, on the relationship between the skill premium and trade in the short run. Some research exists on the relationship between business cycles and skill premiums, and some on the relationship between trade and income volatility. Nonetheless, the possibility of a direct connection between trade and the cyclical behavior of the returns to schooling has not been studied. We attempt to fill this gap by exploring the dispersion of wages between skilled and unskilled workers and its relationship with international trade from an under-investigated lens, namely its cyclical properties. The cyclical properties and determinants of returns to schooling (RTS) can be informative of short-term fluctuations in income inequality and the risk of human capital investments.

Much work has been done to estimate returns to schooling in Latin American countries and elsewhere, for example by Psacharopulous (1989); Psacharopulos and Patrinos (2004). These studies tend to focus on the evolution of cross sectional estimates of the returns to schooling over time. A potential limitation is that the estimates of RTS can be biased because of the well-known ability bias. Also, it may be challenging to disentangle secular movements from business cycle fluctuations. This paper takes a different analytical approach, by proposing the use of pseudo panel to estimated RTS and their cyclical fluctuations. This approach is arguably better suited for identifying both long-term trends and cyclical components of the returns to schooling, although not without flaws. 

To estimate the permanent and cyclical component of returns to schooling, we follow the literature on pseudo-panels based on cohorts developed by Deaton (1985, 1997). This methodology allows us to link repeated cross sections to estimate returns to schooling. Specifically, in a first-stage, pseudo-panels for

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2 See Feenstra and Hanson (2003).
3 See Golberg and Pavcnik (2007).
4 It is noteworthy that our pseudo-panel approach is probably not well suited for identifying long-term trends in RTS because it implies working with a sample of 50 or so cohorts per year, thus reducing significantly the degrees of freedom relative to the repeated Mincerian approach that utilizes thousands of observations of individual workers per year to estimate each year’s average RTS per country. Nonetheless, in principle it provides unbiased estimates of the average RTS for each country as well as deviations from the average, with or without trends. These issues are detailed further below in section 3.
12 Latin American countries based on data from household surveys are used to estimate both trends in RTS as well as deviations from trends. Deviations are equated with the cyclical components of RTS.

In a second stage, the resulting panel data of cyclical deviations from RTS trends is used to analyze the relationship between the transitory component of the returns to schooling and foreign demand, controlling for other determinants of the business cycle. More specifically, the transitory component of returns to schooling is allowed to vary with domestic and external shocks, real and financial shocks and labor market rigidities. Each variable in this stage is decomposed into two parts: a trend and a cyclical component. Only the cyclical component is used in the second stage.

Main findings can be summarized as follows. First, the cyclical components of returns to schooling are significant in 8 out of the 12 countries, whereas long-term trends are significant in less than a handful. Second, the most robust determinant of cyclical fluctuations in returns to schooling is fluctuations in foreign demand for Latin American and Caribbean (LAC) exports. These tend to be positively correlated to returns to schooling. Thus, increases in export volatility might increase the risk of investments in human capital. Third, the effect of export fluctuations (driven by changes in foreign demand) seems to be attenuated by labor-market rigidities, such as constraints on employers to hire temporary workers on an hourly basis.

In regards to the last finding, it is tempting to conclude from a policy perspective that such rigidities can stabilize returns to schooling and thus income inequality (between skilled and unskilled workers). However, this effect needs to be weighed against long-term costs for the economy as a whole, accounting for the fact that rigidities are associated with quantitative impacts on labor markets. Otherwise stated, rigidities should be evaluated by taking into account the potential reduction in hiring as well as the loss of jobs during downturns, rather than as a means to smooth out fluctuations in skill-driven inequality.

The rest of this paper is organized as follows. Section 2 provides a brief literature review on the cyclical properties of returns to schooling, and highlights the literature’s lack of coverage of research in this area for developing countries. Section 3 discusses methodological issues concerning estimates of RTS (including transitory cyclical components) and section 4 presents stylized facts from repeated cross sections of employment surveys from Latin American countries. Section 5 studies the determinants of cyclical fluctuations in the returns to schooling, and section 6 concludes.
2. Related Literature

While the relationship between international trade and the skill premium has been widely studied, the literature has focused mostly on trends before and after episodes of trade-liberalization. As far as we know, the relationship between fluctuations of RTS and the cyclical component of exports has not been studied. Much research has been done on the relationship between RTS and business cycles, and some has been conducted on the relationship between trade and income volatility. But the empirical connection between the cyclical behavior of RTS and exports has not been established.

There is no clear relationship between returns to schooling and the business cycle, either theoretically or empirically. Some studies have found a pro-cyclical response of the skill premium, while others have found a counter-cyclical response. Furthermore, some studies have found a lagged relationship instead of a contemporaneous response.

As mentioned by King (1980), counter-cyclical returns to schooling are supported by theories proposed by Oi (1962) and Reder (1955). Oi (1962) and Mincer (1991) argue that if firms invest in job-specific capital for highly educated workers they have an incentive to retain these workers and lay-off less educated workers during downturns. In Reder (1955), this cyclical behavior is explained by a quality adjustment of the workers over business cycles. During booms, when job applicants become scarce, employers tend to lower hiring standards, thus reducing the wage skill premium. During recessions, when applicants for a given job are often plentiful, skilled workers crowd out unskilled workers.

Kniesner et al. (1978) found a positive relationship between the unemployment rate and the (cross-sectional) rates of returns to schooling, using the United States National Longitudinal Survey from 1966 to 1970. This countercyclical relationship is also found by King (1980), using the same survey for the years 1968 and 1971.

On the other hand, contrasting evidence of a pro-cyclical relationship has also been found. For instance, Ammermueller et al. (2009) (using the German Microcensus from 1996-2003) found an inverse relationship between regional unemployment rates and returns to schooling. Likewise, Ziliak et al. (1999) used data from the U.S. Panel Study of Income Dynamics (PSID) from 1971-1990 and found that RTS are pro-cyclical for whites but counter-cyclical for blacks.

To explain the pro-cyclical relationship, Ammermueller et al. (2009) argue that if the wages of less skilled workers are covered by collective agreements while highly educated workers negotiate directly with their employer, then the wages of skilled workers might be more sensitive to the business cycle than those of unskilled workers. Consequently, the wage premium between skilled and unskilled workers might narrow in recessions. In line with this hypothesis, Raisian (1983) found that skilled workers exhibit

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5 See for example Goldberg and Pavcnik (2007)
6 For empirical evidence on this quality adjustments see Gautier et al (2002), Teulings and Koopmanschap (1989) and Devereux (2004).
more wage variability than the unskilled workers. In his paper, the skilled workers accept a greater variation in their hourly wage in exchange for a stable job, which induces a pro-cyclical wage premium.\(^7\)

Furthermore, some studies have failed to find a contemporaneous relationship between the skill premium and the business cycle, although they argue that a lagged relationship exists. For example, Keane and Prasad (1993) found that the skill premium is uncorrelated with contemporaneous measurements of the business cycle. A similar result was found by Khalifa (2009).\(^8\) He also found that the skill premium is uncorrelated with contemporaneous output, but in this case, there is a lagged, pro-cyclical relationship between the skill premium and output. To explain this observation, Khalifa (2009) developed a model that includes both skilled and unskilled workers as well as two types of vacancies, complex and simple. Complex vacancies can only be filled by skilled workers, while simple vacancies can be filled by either skilled or unskilled workers. It is assumed that complex vacancies are more costly to create than simple ones, thus a technological shock that increases both types of jobs only increases the complex vacancies with a lag. This lagged variation in the labor input of educated workers (in the complex jobs) causes the skill premium to vary pro-cyclically with a lag.

Lindquist (2004) confirmed that the skill premium (in the United States) is uncorrelated with contemporaneous measures of the business cycle, and that the skill premium lags the business cycle.\(^9\) In this study, the above observation is explained by the presence of complementarities between capital and skills. Specifically, increases in the capital-skill ratio increase the relative demand for skilled labor, and hence, increase relative wages.

Thus, the relationship between RTS and the business cycle appears to be ambiguous in developed countries. These mixed results are also found in the scant literature that covers Latin American countries. For instance, Psacharopoulos \textit{et al.} (1996) studied the behavior of RTS in Mexico and found that returns to investment in education fell during recessions and rose during expansions.\(^10\) In contrast, Fasih \textit{et al.} (2010) found that RTS were countercyclical in Mexico and República Bolivariana de Venezuela. For the case of Argentina, earnings of educated workers were less affected in the crises than the earnings of less educated workers during 1992-2002.

The above literature review presents mixed results on the relationship between RTS and the business cycle. Additionally, in general it does not differentiate between types of shocks that might be driven the economy. In particular, the relationship between these returns and foreign demand has not been explored, although there are studies on the relationship between income volatility and trade liberalization.

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\(^7\) Hashimoto (1981) developed a model in this line, in which skilled workers accept higher cyclical variations in wages in return for lower variation in the employment.

\(^8\) Khalifa (2009) used the Outgoing Rotation Group of the U.S. Census Bureau’s Current Population Survey over the period 1979-2004.

\(^9\) Lindquist (2004) used the Monthly Outgoing Rotation Group of the U.S. Census Bureau’s Current Population Survey.

\(^10\) Using the \textit{Encuesta Nacional de Ingresos y Gastos de los Hogares} from 1984, 1989 and 1992.
Di Giovanni and Levchenko (2009) examine the relationship between trade openness and output volatility using industry-level data. Their conclusion is that trade openness is positively related to overall output volatility. This result is explained by three components. First, sectors that are more open to trade are also more volatile. Second, trade is accompanied by increasing specialization and it increases output volatility. Third, sectors that are more open to trade are less correlated with the rest of the economy. This third factor reduces output volatility. Giovanni and Levchenko (2009) conclude that the net effect of these factors is to increase output volatility. Krebs, Krishna and Maloney (2010) use Mexican household data to study the relationship between trade policy (particularly tariff levels) and individual income risk. They found that trade policy has a significant short-run effect on income risk; income risk increases as tariffs fall.

Trade liberalization has also been associated with income inequality. In some studies, this relationship is explained by increases in the skill premium due to increases in labor demand for skilled workers. 11 Goldberg and Pavcnik (2007) offer potential explanations for this empirical observation, among them, “quality” upgrading, “outsourcing” or “global production sharing,” skilled-biased technological change, capital flows and complementarities between capital and skilled labor.

As noted above, the literature on the relationship between returns to schooling and economic activity does not take into account drivers of business cycles, which might affect sectors in different ways. For instance, a rise in economic activity (above trend) might be caused by fluctuations in foreign demand. This would have different effects than, say, changes in global interest rates that affect all firms’ access to credit.

The literature on exports and skill premiums is a good example. Brambilla et al. (2012) suggest that exports tend to be skilled-labor intensive, and thus a temporary rise in foreign demand could be associated with temporary increases in RTS. If so, export volatility might be related to RTS volatility.

As mentioned above, there is evidence that sector volatility rises with their exposure to international trade. If these sectors are also skilled labor intensive, output volatility in these sectors might provoke volatility on the wages of the skilled workers, and a pro-cyclical skill premium. Thus, trade openness might increase RTS volatility, which implies higher risk for human capital investments.

In sum, the existing literature has focused on high-income countries, with mixed results regarding the cyclicality of the relative wage of skilled workers. The literature on developing economies is both limited and equally ambiguous. Furthermore, neither has focused on the relationship between foreign demand and RTS. Finally, it is notable that the few studies that explicitly assess the cyclicality of Latin American skill premiums or returns to schooling have relied on Mincerian estimates of RTS using repeated cross sections of workers. The following section discusses our approach, which attempts to deal with the analytical weaknesses of the standard approach.

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11 See Goldberg and Pavcnik (2007).
3. Methodology

Only a few countries in Latin America conduct employment surveys or provide other data sources that follow workers over time (e.g. Brazil, Argentina, and Mexico). However, even in these few cases, the resulting samples suffer from data problems such as attrition. Furthermore, panel data from social security records often does not include data on workers’ educational attainment. This data constraint imposes potential biases in cross-sectional estimates of RTS. In particular, such estimates suffer from the “ability bias” of estimates of RTS that do not control for unobserved innate ability of workers, which can be correlated with both wages and the workers’ level of education.

Consequently, it seems practical to develop an approach to study returns to schooling for a sample of twelve LAC countries with repeated cross sections of workers. Fortunately, there is an econometrics literature that outlines how to use these data for estimating RTS while simultaneously eliminating the ability bias that afflicts standard Mincerian estimates. Specifically, we use a pseudo-panel approach following Deaton (1997) and Deaton and Paxson (1994).

In this pseudo-panel approach, a group (or cohort) of individuals are followed over time. This semi-aggregated structure allows us to link different surveys for each country to estimate returns to schooling over time. Moreover, it eliminates the ability bias through averaging across workers of a given cohort while controlling for cohort-specific (or generational) effects.

When we estimate RTS using pseudo-panels, they are decomposed into two parts: a trend and a cyclical component. The cyclical component is used in a second stage to look at the relationship between returns to schooling and foreign demand, and other determinants of the business cycle. As the business cycle might be driven by various shocks, we use a set of four variables representing the types of shocks to analyze the determinants of the cyclical component of the returns to schooling.

3.1 Estimation of the Returns to Schooling

Our data consists of a set of household surveys from 12 Latin American countries (see Table 1). In the pseudo-panel approach, a group of workers (cohort) is followed over time as opposed to an individual. A cohort is formed by those individuals that were born in the same year. The relevant variables are thus averages of each cohort.

As Deaton (1997) points out, pseudo-panels have several advantages over panel data. A pseudo-panel does not suffer from attrition because it is constructed from new samples every year. Furthermore, “it is likely to be less susceptible to measurement error than panel data, because the quantity that is tracked is normally an average and the averaging will nearly always reduce the effects of measurement error" (Deaton 1997, p. 120).

As mentioned above, the pseudo-panel approach also removes ability biases. The ability bias refers to the omission of unobserved worker ability in traditional Mincerian estimates of RTS. Individual ability might be correlated with both the level of education and wages. Its omission (as an explanatory variable) might yield biased estimates of RTS. As explained by Warunsiri et al. (2009) and Kaymak (2008),
the pseudo-panel approach washes out any potential ability bias. Angrist (1991) showed that this pseudo-panel approach is equivalent to an IV regression that uses cohort dummies as an instrument for the level of education.12

Moreover, when a cross-section is used to estimate a Mincerian equation, age might not only reflect experience but differences in income due to specific characteristics of each generation or cohort. Different generations might have different schooling opportunities, different initial wealth, or other characteristics that might influence their overall earnings. The pseudo-panel approach allows us to account for these differences by including cohort-specific effects in the estimations of the determinants of earnings.

To apply the pseudo-panel approach, we follow the Mincerian tradition and assume that income is explained by an individual’s level of educational attainment level and experience. Consider the following wage equation:

\[
(1) \quad \ln(w^*_i) = \omega + f(s^*_i)\rho + X^*_i\beta + v_i + \epsilon_{it},
\]

where \( f(\cdot) \) is linear, \( s^*_i \) refers to the educational level of individual \( i \) in year \( t \), \( v_i \) represents characteristics of individual \( i \) (such as innate ability), and \( X^*_i \) refers to other determinants of income. If \( v_i \) is correlated with \( s_i \), the least-squares estimation of (1)—without individual fixed effects, which cannot be included when the data come from repeated cross sections of workers instead of panel data—captures this correlation, and the estimate of \( \rho \) will be biased.

Averaging for each cohort in (1), we obtain the following pseudo-panel model:

\[
(2) \quad \ln(w^*_c) = \omega + f(s^*_c)\rho + X^*_c\beta + v_c + \epsilon_{ct},
\]

In equation (2) the subscript \( c \) represents a birth cohort.13 As noted by Kaymak (2008) and Warunsiri and McNown (2009), this averaging eliminates the ability bias, and a cohort fixed effect, \( v_c \) can be included in the model when working with data from repeated cross sections of workers.

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12 While the pseudo-panel approach has many advantages described above, it also has some weaknesses. One concerns selectivity biases due to workers approaching retirement age. We thank John Giles for pointing this out. Another weakness concerns measurement error in the cohort averages that might be due to sampling errors, as the surveys are not designed to be representative of workers by cohort. We follow Deaton (1985, 1997) and Deveraux (2007a,b) and use Weighted Least Squares with the number of workers in each cohort group and year of the survey as the weights. Thus we place more weight on observations with a larger number of (randomly) sampled workers by cohort-year.
Thus, for each country, we estimate the following model:

\[
\ln(w_{ct}) = \omega + A\alpha + C\theta + Y\psi + f(s_{ct})\rho + \varepsilon_{ct},
\]

where $A$ is a matrix of age dummies, $C$ is a matrix of cohort dummies, $f(s)$ is linear and $Y$ is a matrix that allow us to capture the cyclical component of wages by year. The latter was proposed by Deaton and Paxson (1994) to solve the problem of collinearity between cohort, age and year effects. As mentioned above, since a cohort is defined by an individual’s birth year, there is a linear relationship between the cohort ($c$), age ($a$) and the year ($t$): $c = t - a$. Given this (linear) relationship, it is thus impossible to estimate (3) using dummy variables for age, cohort and years. To address this problem, Deaton and Paxson (1994) propose attributing time trends to age and cohort effects, and using the year effect to capture only cyclical fluctuations. Deaton (1997) suggested regressing $\ln(w_{ct})$ on cohort dummies (excluding the first), dummies for age (excluding the first), and a set of $\tau - 2$ year dummies defined as:

\[
d_t^* = d_t - [(t-1)d_{t-1} - (t-2)d_{t-2}],
\]

where $t = 3, \ldots, \tau$ and $d_t$ equals 1 if the year is $t$ and 0 otherwise. The matrix $Y$ is formed by the variables $d_t^*$, with the sum of its elements being equal to zero. That is, the decomposition ensures that the effects captured by $d_t^*$ are strictly transitory (i.e. they are orthogonal to a linear trend and sum to zero).

In our regressions, we include years of schooling (YOE), the interaction between YOE and a linear trend $T$, and an interaction between YOE and dummy variables $d_t^*$. The coefficient on the last interaction provides an estimate of the cyclical component of RTS. The estimation model is thus:

\[
\ln(w_{ct}) = \omega + A\alpha + C\theta + Y\psi + s_{ct}\rho_1 + Ts_{ct}\rho_2 + \sum_{t=3}^{\tau} s_{ct}d_t^*\rho_t + \varepsilon_{ct}
\]

This specification is quite flexible; it allows for cyclical and trend components in RTS. To justify the inclusion of the trend, recall that (as highlighted by Goldberg and Pavcnik, 2007) some countries have experienced an increase in the skill premium over time, particularly after engaging in trade reforms. This trend might reflect an increase in the demand for skilled workers caused by outsourcing of skill-intensive activities, increasing capital flows that are complementary to skilled labor, or by skill-biased technological change, for example.

On the other hand, the relative supply of educated workers has also changed as the coverage of educational systems has improved in LAC. Thus, changes in either the relative supply or demand for

\textsuperscript{13} $\ln(w^*_{ct})$ represents the average of $\ln(w^*_{ct})$. 

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skilled workers, which occur gradually, can account for a trend in RTS. For example, Riveros (1990) found a declining time-trend in rates of return for Chile in the period 1960-1985. This trend is explained by the expansion of the educational system, the shift of labor demand from middle education to primary skills and by the increasing real costs of education. Similarly, Patrinos and Sakellariou (2006) found that RTS in República Bolivariana de Venezuela declined steadily from the 1970s to the mid-1990s, followed by an increasing trend thereafter. The authors suggest that during the 1990s in República Bolivariana de Venezuela, the lack of opportunities in the formal sector resulted in an increasing number of workers moving to the informal sector, where the returns to education are low, therefore increasing RTS. Psacharopoulos (1989) presents the behavior of RTS for a large number of countries finding a declining trend over time. In part, this tendency is explained by expansions of the educational system. When this is the case, it is prudent to allow for deterministic trends in the estimation of RTS and its cyclical components as in our preferred model (5).

For practical reasons, we limit our sample to male workers with information on income, hours worked and years of education in each survey. We also restrict our sample to those within a certain age range, which varies from country to country. This range was selected to avoid the inclusion of younger individuals who are simultaneously working and acquiring more years of education. The estimates of RTS can be distorted by these young workers who have not finished their education but report income from part time jobs, or jobs which do not fully reflect their RTS.

In order to select the minimum age, we calculated Deaton’s decomposition for years of schooling. The minimum age was selected as the point at which the age effect flattens. The maximum age was fixed at 65 years old, except for those countries in which a pension can be obtained earlier. Only salaried male workers and use their hourly (real) income was included to estimate RTS. In the estimations, we used weighted least squares taking the size of the cohort as weights, which helps dilute biases due to sampling errors that affect averages by cohort group.

### 4. Stylized Facts

We first describe some facts regarding the behavior of RTS over the business cycle. Figure 1 shows the cyclical component of RTS against the unemployment rate. Some countries such Argentina, Chile, Colombia, Uruguay and Mexico show an inverse relationship between the unemployment rate and the cyclical component of RTS. On the other hand, some countries present a direct relationship between the cyclical component of RTS and the unemployment rate; for instance, Honduras, Ecuador, El Salvador and Costa Rica. The cyclical components are (jointly) statistically different from zero for Argentina, Chile, Uruguay, Mexico, República Bolivariana de Venezuela and Brazil. Among these countries, only República

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14 The inclusion of female workers would complicate the estimation due to selectivity biases related to the decision to participate in the labor market.

15 Although for these latter countries the cyclical components are not (jointly) statistically different from zero.
Bolivariana de Venezuela and Brazil showed a positive correlation between the cyclical RTS and the unemployment rate.\textsuperscript{16} Thus, when the cyclical components of RTS are (jointly) statistically different from zero, it seems that an inverse relationship between RTS and the unemployment rate exists. When the unemployment rate increases, there is thus a decrease in the wage gap between skilled and unskilled workers. Consequentially, when there is a boom in economic activity, the wage difference between more qualified and less qualified workers tends to widen while in recessions, the wage difference seems to narrow.

We argue that this result is driven by external shocks to the economy. In order to observe the impact of external shocks, we look at the relationship between RTS and four types of shocks instead of using a broad measure of business cycles. They represent external real shocks, external nominal shocks, domestic real shocks and domestic nominal shocks. Partitioning in this way, we found that RTS fluctuate when a country experiences an external (real) shock. To present some preliminary evidence on this relationship, we first define our measurement of an external (real) shock.

We applied a gravity model for each bilateral country pair to estimate the effect of changes in trading partners’ GDP on each country’s merchandise exports to capture fluctuations of foreign demand for domestically produced goods, after controlling for bilateral distance and the country’s own GDP.\textsuperscript{17} In turn, we computed the effect of deviations from trends in trading partners’ GDP on a country’s exports as the product of the estimated coefficient on the importers’ GDP times the change of the average annual GDP of each country’s trading partners. The deviation from the trend (or cyclical component) was used as the external shock.

Figure 2 shows the relationship between the (cyclical component of) RTS and our external demand shock for the twelve countries in our sample.\textsuperscript{18} Six economies present a positive correlation between these two variables (Argentina, Chile, Costa Rica, Colombia, Peru and Uruguay). Moreover, there is a positive association between this correlation and the variance of the external shock (Figure 3).\textsuperscript{19} Generally speaking, countries that experience greater external volatility seem to present a positive correlation between the external shock and RTS. Thus, a large external shock seems to be accompanied

\textsuperscript{16} Given that for some countries the cyclical component is not (jointly) significant, in the second stage we weight by the (inverse of the) standard error of the component

\textsuperscript{17} Other variables included in the gravity specification include: import tariffs, (the log of) the distance between country $i$ and country $j$, a dummy variable that takes a value of 1 if the two countries are contiguous, a dummy variable that indicates if the two countries share their official language, a dummy variable that indicates if the two countries have a preferential trade agreement, a dummy variable if country $j$ is landlocked, and a set of year dummy variables. To construct the preferential trade agreement variable, we used data from the WTO-Regional Trade Agreements Information System. This database contains information on the regional trade agreements of the WTO members, but only covered those agreements that have been notified to the WTO and are in force.

\textsuperscript{18} Aggregate unemployment rates come from the International Labour Organization (ILO), so that the definition of unemployment is consistent across countries.

\textsuperscript{19} An important exception might be Venezuela, which presents a higher variance of the external shock and a low (negative) correlation between the external shock and RTS.
with a cyclical variation of RTS. When the volatility of the external shock is low, the correlation between RTS and the shock is also low or negative.

The relationship between the external shock and RTS might also be related to the degree of labor market flexibility. A negative relationship is found when the correlation between the external shock and RTS is graphed against two indexes of labor market rigidity: rigidity of working hours and rigidity of employing workers. It seems that more flexibility on the labor market is related to a positive correlation between foreign demand shocks and RTS (see figure 3).

These facts suggest that economies with flexible labor markets and higher foreign demand volatility present a positive correlation between RTS and foreign demand shocks. When this is the case, an increase in foreign demand is related to an increase in RTS, and then in the wage-gap between skilled and unskilled workers.

5. Results

It is worth analyzing the statistical significance of our cyclical RTS estimates. Table 2 contains the estimates for the specifications with a linear deterministic trend in wages and a linear deterministic trend in RTS. As shown in the last column, the cyclical components of RTS are jointly statistically significant (at the 10 percent level) in seven cases. They are not jointly statistically significant in Colombia, Ecuador, Honduras, Peru and El Salvador. The linear trend in RTS is significant in five countries, namely Argentina, Chile, Costa Rica, Peru and República Bolivariana de Venezuela.

For our purposes is important to take into account that not all deviations of RTS from its trend are statistically significant. This implies that, in our analysis, we need to account for the lack of precision of the estimates. Consequently, the results reported further below come from Weighted Least Squares estimations, where the inverse of the standard error of each deviation of RTS from its trend is used as weight for each observation.

As mentioned above, transitory RTS could be affected by different types of shocks. Economies can face foreign or domestic shocks, and within these categories, the shocks can emanate from financial markets or from the real sector. Therefore, for the econometric study we focus on: external real-sector shocks; domestic real-sector shocks; external financial shocks; and domestic financial shocks.

The external real-sector shock is related to changes in foreign demand for domestic goods. To capture the effect of fluctuations in foreign demand for domestically produced goods we used the gravity model of trade for each country to estimate the effect of changes in trading partners’ GDP on each country’s merchandise exports, after controlling for bilateral distance and the country’s own GDP. In turn, we

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20 Other variables included in the gravity model of bilateral trade flows are the following: import tariffs, (the log of) the distance between country $i$ and country $j$, a dummy variable that takes a value of 1 if the two countries are contiguous, a dummy variable that indicates if the two countries share their official language, a dummy variable that indicates if the two countries have a preferential trade agreement, a dummy variable if country $j$ is landlocked, and a set of year dummy variables. To construct the preferential trade agreement variable, we used data from the WTO-Regional Trade Agreements Information System. This database contains information on the
computed the effect of deviations from the trend in trading partners’ GDP on a country’s exports as the product of the estimated coefficient on the importers’ GDP times the annual change in average GDP of each country’s trading partners. Data come from the International Monetary Fund, the World Bank, and the French Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).

For the domestic real-sector shock, we used the deviation from the trend of each country’s consumer price index. Rising inflation is interpreted as domestic demand exceeding the rise in domestic output. CPI data come from the World Bank.

The external financial shock was defined as the deviation from the trend of the product of the United States lending interest rate and the ratio of the country’s foreign debt to Gross National Income, in the previous year. Data come from the International Monetary Fund.

The domestic financial shock is defined as the deviation from the trend of the product between the domestic lending rate and the ratio of domestic credit to the private sector to GDP, in the previous year. Additional results using alternative domestic interest rates, such as deposit rates, are also presented. Data come from the International Monetary Fund.

All explanatory variables were transformed into their transitory components using the same trends that were used to estimate the cyclical component of RTS. That is, when we assumed a linear trend for RTS, we de-trended the explanatory variables using a linear trend; when the root of the linear trend was used for RTS, we used the same for the explanatory variables, and so on. The basic idea is to use a common de-trending approach for both sides of the model.

In addition to the transitory economic fluctuations defined above, we also consider the effects of labor market rigidities. More specifically, we use data from the World Bank Doing Business database on constraints for employers to hire workers on an hourly basis, difficulty using redundancy as a reason to fire workers, and constraints on hiring temporary workers. These indices were averaged from 2004 to 2009. They range between 0 and 100, with higher values indicating more rigid regulation. In addition, we also included the ratio of the minimum wage to the median wage as a proxy of labor market rigidity. Since the econometric models include country fixed effects, these variables were multiplied by the external real shock, and estimated coefficients can be interpreted as the effects of these labor-market features on the impact of the shock on the transitory component of RTS within countries.

5.1 Cyclical Components of RTS and Real External Shocks in Latin America

In this section we present the results on the relationship between the cyclical RTS and external shocks. The main result is the direct relationship between RTS and the external real shock. When (contemporaneous or lagged) foreign demand increases over its trend, returns to schooling also increase. This means that an increase in exports widens the wage differential between skilled and

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21 For details about these indices see www.doingbusiness.org.
unskilled workers. This is consistent with the hypothesis presented in Brambilla et al. (2010), in which the export firms tend to hire more educated workers and pay higher wages. Moreover, the increase in returns to schooling is higher for those countries with more flexible labor markets, as measured by means of the redundancy and hours indices. These results are presented in Tables 3 and 4.

Table 3 illustrates the significant relationship between cyclical RTS and foreign demand shocks. This Table shows the regression of the cyclical component of RTS on the four shocks described above. The main result is that export shocks are positively and significantly associated with the cyclical RTS. This holds for both the contemporaneous shock and its lag. Moreover, a similar relationship is found between cyclical RTS and deviations of the consumer price index from its trend. An increase of the consumer price index above its trend value increases RTS.

We next look at the role of labor market flexibility on the relationship between RTS and exports (Table 4). We conclude that there is a significant relationship between cyclical RTS and the interaction between the export shock and the two indices of labor market rigidity: the rigidity of working hours and the difficulty of redundancy. Both the relationship between and the interaction between the export shock and each of these indices is negative. Thus, an increase in exports (due to an increase in foreign GDP) will increase the wage gap between higher and lower skilled workers, but this gap will increase less in countries with higher restrictions to fluctuations in working hours or our ability to shed redundant workers. Thus, flexible labor markets seem to amplify the response of RTS when there are variations in foreign demand.

These results suggest that a country which exhibits higher volatility in its foreign demand and has a flexible labor market might also experience higher volatility of RTS, i.e. a higher risk of investment in human capital and higher volatility in the income distribution.

We next conduct robustness exercises to confirm the validity of our results. The above estimations assumed that RTS can be decomposed in a constant term, a trend and a cyclical component. In particular, we assumed a linear trend. To test robustness of our assumption, we repeat the estimations using a different trend definition. A change in the definition of trend must be accompanied by a variation in the definition of the year variables in Y, given that these variables must be orthogonal to the trend. In general, if we assume a trend variable \( T = (t_1, t_2, t_3, ..., t_n)' \) with \( t_1 \neq t_2 \), then the matrix \( Y \) will be formed by the vectors:

\[
d^*_i = d_i - \left[ \frac{(t_i - t_1)}{(t_2 - t_1)} d_2 - \frac{(t_i - t_2)}{(t_2 - t_1)} d_1 \right]
\]
Where \( i=3,. . . ,n \) and \( d_i \) equals 1 if the year is \( i \) and 0 otherwise. This set of variables is formed by \((n-2)\) linearly independent vectors that are orthogonal to \( T \) and sum to zero.

Table 5 shows the results when the square root of a linear trend was used both to calculate RTS as and decompose the shock variables. These estimations corroborate the main results; there is a direct relationship between cyclical RTS and (the lagged) export shock as well as a direct relationship between RTS and deviations in the CPI from the trend. Moreover, when the square root of the linear trend is used, the interactions between the exports and the hours and redundancy index are (again) significant and they move inversely to RTS.\(^ {22} \)

It is evident that the most significant and robust explanatory variable is the deviation (from the trend) of foreign demand for LAC exports. This is especially true when the variable is lagged. It consistently appears with a positive effect and its interaction with labor-market institutions is also significant. It appears that when foreign demand is above the trend, RTS within countries tend to rise, but this effect is attenuated by labor-market rigidities.

The only other somewhat robustly significant variable is the (deviation from the trend of the) consumer price index. When the price index is above its trend level, RTS tend to rise. These results imply that when an economy is over-heating, the average wage of skilled labor temporarily rises more than that of unskilled workers. Moreover, the magnitude of the effect of temporary inflation on the cyclical component of RTS is smaller than that of the export demand variable.\(^ {23} \)

Broadly speaking, these results suggest that, for the twelve LCR economies included in this analysis, the most important driver of cyclical fluctuations in RTS within countries is temporary fluctuations in foreign demand for exports. The results are thus consistent with an important strand of the labor economics literature as well as with a more recent literature related to the role of exports in shaping the relative demand for skills (Veerhogen 2008; Brambilla et al. 2011, 2012). Furthermore, if trade openness increases the volatility of foreign demand, then it might also increase the volatility of returns to schooling. Subsequently, higher volatility of RTS might also imply a higher variance in a country’s income distribution, which can be interpreted as a higher risk of investments in human capital.

\(^ {22} \) The same results are found if we include the unemployed (assuming an income of 1 unit). The inclusion of the unemployed has the advantage of taking into account the adjustment in quantities and not only on wages, but there is a problem of self-selection associated with this group.

\(^ {23} \) The standard deviation of the price index is about 0.6 and that of the export variable is about 0.05. In table 5.2, the coefficients on the latter variable for both samples are more than 15 times larger than the corresponding coefficients for the price index. Since the standard deviation of the price index is only about 12 times larger, the implied normalized coefficients (i.e., the product of the standard deviation of each variable times their estimated coefficient) for exports are at least 27 percent larger than the normalized coefficient of the price index. The normalized coefficient of the export variable is much larger (more than twice as large) relative to the normalized coefficient of the price index for the case of the sample of salaried and unemployed workers.
6. Concluding Remarks

This paper reviewed the extensive literature on the cyclical properties and determinants of skill premiums and returns to schooling, which are highly focused on high-income countries. The few studies that look at LAC economies specifically appear to present contradictory evidence and rely exclusively on analyses of the evolution over time of standard Mincerian estimates of returns to schooling.

The research presented here is somewhat unique in its use of a pseudo-panel approach to the estimation of the permanent, trend and cyclical components of RTS. While not totally bullet-proof, this approach is appealing insofar as it gets rid of ability biases in the estimates of RTS, and can be implemented for any developing country with repeated cross-sections of household employment surveys.

In addition, the analyses attempted to link four types of transitory economic fluctuations with the cyclical components of RTS in models that controlled for time invariant country characteristics and time-period effects common to all observations from a given year. The evidence suggests that temporary fluctuations in foreign demand for LAC exports are perhaps the most important driver of cyclical movements of RTS within countries.

It is worth recalling that changes in the average relative wage of skilled labor relative to unskilled labor can be due to changes in the number of jobs and the composition of workers that remain employed. Indeed, the results presented in this paper are consistent with labor and trade models driven by compositional changes rather than changes in the wages of workers that remain employed throughout the cycle. Furthermore, trade—and to a lesser extent inflation—appear to be the main drivers of transitory fluctuations in returns to schooling.

The evidence also suggests that flexibility of the labor market plays a role in the transmission of foreign real shocks. More flexible labor markets seem to be a factor that amplified the response of RTS when there are variations in foreign demand. Thus, countries that have flexible labor markets and experience a considerable volatility of their external sector might also experience a greater volatility of RTS, which might be reflected in greater volatility of income distribution and a higher risk of disinvestments in human capital.
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| Country      | Survey        | Years   | Number of Surveys | Age Range | Consumer Price Index | Source | Coverage |
|--------------|---------------|---------|-------------------|-----------|----------------------|--------|----------|
| Argentina    | EPH and EPHC  | 1995-2006 | 12                | 26-65     | October              | INDEC  | Urban    |
| Brazil       | PNAD          | 1992-2007 | 14                | 28-65     | September            | IBGE   | National |
| Chile        | ESI           | 1990-2008 | 18                | 25-65     | November             | INE    | National |
| Colombia     | ENH and ECH   | 1984-2004 | 21                | 26-60     | September            | DANE   | Urban    |
| Costa Rica   | EHPM          | 1987-2009 | 23                | 24-65     | July                 | INEC   | National |
| Ecuador      | EPED and ENEMDU | 1989-2009 | 20                | 27-65     | November             | INEC   | Urban    |
| El Salvador  | EHPM          | 1995-2007 | 13                | 29-60     | December             | DIGESTYC | National |
| Honduras     | EPHPM         | 1990-2007 | 17                | 25-65     | May                  | INE    | National |
| Mexico       | ENEU          | 1987-2001 | 15                | 26-65     | November             | INEGI  | Urban    |
| Peru         | ENAHO         | 1997-2009 | 13                | 15-65     | November             | INEI   | National |
| Uruguay      | ECH           | 1991-2009 | 19                | 25-60     | December             | INE    | Urban    |
| Venezuela, RB| EHM           | 1980-2006 | 26                | 27-65     | September            | INE    | National |
Table 2. Components of the Returns to Schooling (Linear Trend, various years)

| Country        | Constant Coefficient | Constant P-value | Trend Coefficient | Trend P-value | Cyclical (Average) Coefficient Mean | Cyclical (Average) P-value F-test |
|----------------|----------------------|------------------|-------------------|--------------|-------------------------------------|----------------------------------|
| Argentina      | 0.087                | 0.000            | -0.005            | 0.036        | -0.001                              | 0.0002                           |
| Brazil         | 0.124                | 0.000            | -0.001            | 0.414        | 0.001                               | 0.0023                           |
| Chile          | 0.073                | 0.000            | 0.002             | 0.026        | 0.000                               | 0.0000                           |
| Colombia       | 0.062                | 0.211            | -0.003            | 0.398        | 0.000                               | 0.1680                           |
| Costa Rica     | 0.066                | 0.000            | 0.002             | 0.006        | 0.000                               | 0.0715                           |
| Ecuador        | 0.054                | 0.000            | 0.000             | 0.753        | 0.001                               | 0.8377                           |
| Honduras       | 0.097                | 0.000            | 0.001             | 0.368        | -0.001                              | 0.4275                           |
| Mexico         | 0.105                | 0.000            | -0.001            | 0.175        | 0.000                               | 0.0411                           |
| Peru           | 0.022                | 0.044            | 0.007             | 0.000        | 0.001                               | 0.1409                           |
| EL Salvador    | 0.057                | 0.000            | 0.000             | 0.675        | 0.001                               | 0.8374                           |
| Uruguay        | 0.097                | 0.000            | 0.000             | 0.868        | -0.001                              | 0.0248                           |
| Venezuela, RB  | 0.148                | 0.000            | -0.004            | 0.000        | 0.000                               | 0.0043                           |

Note: The p-val of the mean cyclical component corresponds to the F-test for joint significance of all interactions between the years of schooling and year dummies (see text for details)

Source: Own calculations
Figure 1. Cyclical Component of the Returns to Schooling and the Unemployment Rate by Country

Argentina

Brazil

Chile

Colombia

Costa Rica

Ecuador

Honduras

Mexico

El Salvador

Peru

Uruguay

Venezuela

Source: Own calculations and ILO.
Figure 2. Cyclical Returns to Schooling and External Shock: Salaried Workers

Source: Own calculations
Figure 3. Returns to Schooling, External (Real) Shock and Labor Market Rigidity

- **Standard Deviation (SD) of the RTS and the SD of the External Shock: Salaried Workers**

- **Correlation Between the RTS and External Shock Against the SD of the External Shock**

- **Correlation Between the RTS and External Shock Against the Rigidity of Working Hours**

- **Correlation Between the RTS and External Shock Against the Rigidity of Employing Workers**

Source: Own calculations
Table 3. Second Stage Regressions: Linear trend and Salaried Workers
Depend Variable Cyclical RTS

|                      | Panel A: Current Exports | Panel B: Lagged Exports |
|----------------------|--------------------------|-------------------------|
|                      | (1)         | (2)         | (3)         | (4)         | (5)         | (6)         | (7)         | (8)         | (9)         |
| Exports/ Exports(-1) | 0.138       | 0.112       | 0.126       | 0.152       | 0.133       | 0.153       | 0.152       | 0.131       | 0.154       |
| Panel A / Panel B   | (0.067)**   | (0.064)*    | (0.066)*    | (0.073)**   | (0.071)*    | (0.072)**   | (0.073)**   | (0.072)*    | (0.073)**   |
| Ext. Financ         | -0.301      | -0.293      | -0.316      | -0.327      | -0.327      | -0.353      | -0.286      | -0.271      | -0.315      |
|                      | (0.103)***  | (0.094)***  | (0.109)***  | (0.112)***  | (0.102)***  | (0.119)***  | (0.113)***  | (0.101)***  | (0.122)***  |
| CPI                  | 0.009       | 0.019       | 0.009       | 0.011       | 0.022       | 0.010       |              |              |              |
|                      | (0.003)***  | (0.008)**   | (0.003)**   | (0.004)***  | (0.009)**   | (0.004)**   |              |              |              |
| CPI(-1)              |              |              |              | 0.009       | 0.018       | 0.009       |              |              |              |
|                      |              |              |              | (0.004)***  | (0.011)     | (0.004)**   |              |              |              |
| Dom. Financ          |              |              |              |             |             |             |              |              |              |
| Lending rate         | -0.036      |             |             | -0.029      |             | -0.027      |              |              |              |
|                      | (0.026)     |             |             | (0.026)     |             | (0.026)     |              |              |              |
| Deposit rate         |              | 0.005       |             | 0.004       |             | 0.004       |              |              |              |
|                      |              | (0.002)**   |             | (0.002)*    |             | (0.003)     |              |              |              |
| Real rate            | -0.036      |             | -0.041      | -0.041      |             | -0.041      |              |              |              |
|                      | (0.023)     |             | (0.026)     | (0.026)     |             | (0.026)     |              |              |              |
| Obs                  | 165         | 172         | 165         | 151         | 156         | 151         | 151         | 156         | 151         |
| R-square             | 0.22        | 0.20        | 0.22        | 0.23        | 0.22        | 0.23        | 0.22        | 0.21        | 0.23        |

All regressions include country and year dummy variables and no intercept
Levels of Sig: 1% ***, 5%**, 10%*
|                  | Panel A: Current Exports |                  | Panel A: Lagged Exports |
|------------------|-------------------------|------------------|-------------------------|
|                  | (1)                     | (2)              | (3)                     | (4)                     | (5)              | (6)              | (7)              | (8)              |
| **Depend Variable** Cyclical RTS |                         |                  |                         | **Depend Variable** Cyclical RTS |                         |                  |                         |                  |
| **Panel A: Current Exports** |                         |                  |                         | **Panel A: Lagged Exports** |                         |                  |                         |                  |
| Exports/Exports(-1)) | 0.181                   | 0.153            | 0.178                   | Exports/Exports(-1)) | 0.144             | 0.255            | 0.257            | 0.247             | 0.240             |
| Panel A / Panel B  | (0.084)**               | (0.095)          | (0.081)**               | Panel A / Panel B  | (0.093)           | (0.108)**         | (0.111)**         | (0.095)**         | (0.099)**         |
| Hours *(Exports/Exports(-1)) | -0.002                   | -0.002           | -0.002                   | Hours *(Exports/Exports(-1)) | -0.002             | -0.002           | -0.002           | -0.002           | -0.003           |
| Panel A / Panel B  | (0.001)**               | (0.001)****      | (0.001)****             | Panel A / Panel B  | (0.001)****       | (0.001)****       | (0.001)****       | (0.001)****       | (0.001)****       |
| Redundancy*(Exports/Exports(-1)) | -0.002                   | -0.002           | -0.001                   | Redundancy*(Exports/Exports(-1)) | -0.001            | -0.002           | -0.002           | -0.002           | -0.002           |
| Panel A / Panel B  | (0.001)****             | (0.001)****      | (0.001)****             | Panel A / Panel B  | (0.001)****       | (0.001)****       | (0.001)****       | (0.001)****       | (0.001)****       |
| W_{min}/W_{med} *(Exports/Exports(-1)) | 0.089                   | 0.101            | 0.042                   | W_{min}/W_{med} *(Exports/Exports(-1)) | 0.065             | 0.065            | 0.066            | 0.044             | 0.055             |
| Panel A / Panel B  | (0.082)                 | (0.084)          | (0.081)                 | Panel A / Panel B  | (0.081)           | (0.107)           | (0.108)           | (0.099)           | (0.100)           |
| Ext. Financ       | -0.206                  | -0.207           | -0.252                  | Ext. Financ       | -0.227            | -0.192           | -0.157           | -0.224           | -0.184           |
| Panel A / Panel B  | (0.095)**               | (0.101)****      | (0.088)****             | Panel A / Panel B  | (0.094)****       | (0.108)**         | (0.110)           | (0.103)****       | (0.103)***        |
| CPI              | 0.007                   | 0.014            | 0.010                   | CPI              | 0.010             | 0.008            | 0.014            | 0.014             | 0.014             |
| Panel A / Panel B  | (0.004)**               | (0.008)***       | (0.003)****             | Panel A / Panel B  | (0.004)           | (0.010)           | (0.003)****       | (0.011)           |                  |
| CPI(-1)          | 0.005                   | 0.010            | 0.008                   | CPI(-1)          | 0.010             | 0.008            | 0.014            | 0.014             | 0.014             |
|                 | (0.004)                 | (0.010)          | (0.003)****             |                 | (0.004)           | (0.010)           | (0.003)****       | (0.011)           |                  |
| Dom. Financ      |                         |                  |                         | Dom. Financ      |                         |                  |                         |                  |                  |
| Lending rate     | -0.016                  | -0.015           | -0.010                  | Lending rate     | -0.010            | -0.008           | 0.003            | 0.003             |                  |
| Panel A / Panel B  | (0.026)                 | (0.029)          | (0.026)                 | Panel A / Panel B  | (0.026)           | (0.026)          | (0.026)         |                  |                  |
| Deposit rate     | 0.004                   | 0.002            | 0.003                   | Deposit rate     | 0.003             | 0.002            | 0.003            | 0.003             |                  |
| Panel A / Panel B  | (0.002)                 | (0.003)          | (0.002)                 | Panel A / Panel B  | (0.002)           | (0.003)          | (0.002)         |                  |                  |
| Obs              | 165                     | 151              | 172                     | Obs              | 156              | 151              | 151              | 156              | 156              |
| R-square         | 0.31                    | 0.29             | 0.29                    | R-square         | 0.29             | 0.32             | 0.32             | 0.32             | 0.31             |

All regressions include country and year dummy variables and no intercept.
Levels of Sig: 1% ***, 5%**, 10%*
Table 5. Second Stage Regressions: Square Root Trend, Salaried Workers
Depend Variable Cyclic RTS

| Panel A: Current Exports | Panel B: Lagged Exports |
|--------------------------|-------------------------|
|                          | (1)         | (2)         | (3)        | (4)        |
| Exports/Exports(-1)      | 0.165       | 0.136       | 0.231      | 0.235      |
| Panel A / Panel B        | (0.090)*    | (0.102)     | (0.113)**  | (0.117)**  |
| Hours *(Exports/Exports(-1)) | -0.001       | -0.002       | -0.002     | -0.002     |
| Panel A / Panel B        | (0.001)**   | (0.001)**   | (0.001)**  | (0.001)*** |
| Redundancy*(Exports/Exports(-1)) | -0.001       | -0.001       | -0.001     | -0.001     |
| Panel A / Panel B        | (0.001)**   | (0.001)*    | (0.001)**  | *0.001)**  |
| Wout/Win*(Exports/Exports(-1)) | 0.124       | 0.138       | 0.099      | 0.099      |
| Panel A / Panel B        | (0.084)     | (0.086)     | (0.108)    | (0.110)    |
| Ext. Financ             | -0.204      | -0.198      | -0.202     | -0.159     |
| (0.094)**               | (0.101)*    | (0.108)*    | (0.111)    |
| CPI                     | 0.009       | 0.012       |            |            |
| (0.004)**               |            | (0.003)***  |            |            |
| CPI(-1)                 | 0.007       | 0.011       |            |            |
| (0.004)**               |            | (0.003)***  |            |            |
| Dom. Financ             |            |            |            |            |
| Lending rate            | -0.016      | -0.015      | -0.010     | -0.008     |
| (0.027)                 | (0.029)     | (0.025)     | (0.025)    |            |
| Obs                     | 151         | 151         | 151        | 151        |
| R-square                | 0.29        | 0.28        | 0.31       | 0.30       |

All regressions include country and year dummy variables and no intercept
Levels of Sig: 1% ***, 5%**, 10%*