

# Skill formation in Uruguay: what are the required labour qualifications for development?

María Inés Terra  
Rossana Patrón



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## **Abstract**

At the global level, trade in services has been the most dynamic sector, with an average growth rate about double that in the primary and manufacturing sectors. However, the three activities have a completely different composition in terms of type of labour, services being the most skill-intensive. In Uruguay, the formation of human resources shows several weaknesses; which leads one to ask: Is Uruguay prepared to take advantage of the opportunities open in the global market? If not, what are the consequences? A simulation exercise was tried consisting of an increase in external demand for skill-intensive services, following the global trend of trade in services and the increasing participation of Uruguay in such trade. The results show that, in a context where the educational system does not improve its performance, the scenario of increasing external demand for services leads to an increase in the wage gap across qualifications. But this is not a necessary result. Educational policies aiming at improving the efficiency of the education sector will contribute to a better matching between demand and supply of qualifications, allowing the expansion of dynamic sectors with a reduction in inequality.



## I. Introduction

Education, as a producer of human resources, has a crucial role to play in development as it determines growth possibilities. There seems to be an obvious question to ask: is the education system generating the right mix of workers according to what is required for long-term development? Taking into consideration the heavy early dropouts in developing countries and the increasing demand for skills, the answer is not obvious, though we suspect that we are in trouble. Early dropouts reduce the average qualifications of the labour force, whereas worldwide, the demand for certain qualifications is increasing. The aim of the paper is to analyse the economy-wide effects of a mismatch between generation and demand for skills, in particular, the long-term consequences of an inefficient educational system and its distributional effects on a small developing economy such as that of Uruguay.

In most developing countries, educational systems are inefficient. On one hand, the presence of high repetition rates increases the cost of the process of skill formation. On the other hand, the presence of high rates of early dropouts reduces the qualifications of individuals entering the labour market, in contrast to what is actually being demanded, thereby producing external inefficiency. The rate of growth of skills is directly related to schooling level, so if the efficiency of the education system is enhanced, thus improving completion rates and higher studies, the ratio of skill to unskilled labour will increase. The external efficiency will also be improved as the educational system will be delivering workers with qualifications required in the labour market.

The unsatisfactory system performance of the education sector has economy-wide repercussions: an inefficient production of capabilities has direct effects on social and economic development. For instance, while it has been noted that demand for skills is rising in Latin American countries, Paus (2003) and De Ferranti et al. (2003), among others, suggest that failure to develop the human capital base has been a major drawback to the development of the region. Besides, distributional effects are also expected from underperforming educational systems, and several papers have discussed the role of demand and/or supply of skills in explaining the rise in wage inequality (Razzak and Timmings, 2008; Sanchez and Shady, 2003; Avalos and Savvides, 2003; Birdsall et al, 1995, among others).

This article investigates the economy-wide effects of a deficient skill formation process, in particular, on growth and income distribution. A Computable General Equilibrium (CGE) application based on the recently updated Social Accounting Matrix 2005 for Uruguay (Terra et al, 2009), using a close to standard Heckscher–Ohlin (HO) model, is used to investigate the long-term effects. The simulation results for alternative patterns of endowment growth highlight the relevance of skill formation policies for income distribution and growth patterns.

This paper has the following structure. Section II describes the general settings of the model. Section III describes the Uruguayan situation in the education sector, labour market, trade, and growth. Section IV describes the scenarios and the assumptions. Section V presents the simulation results.



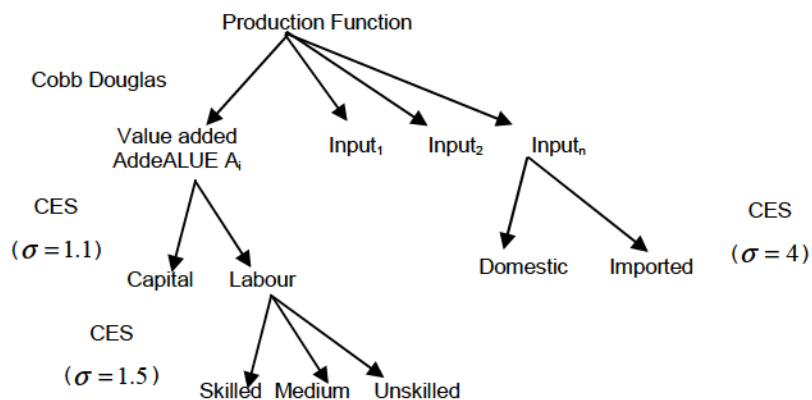
## II. The model

### A. General description

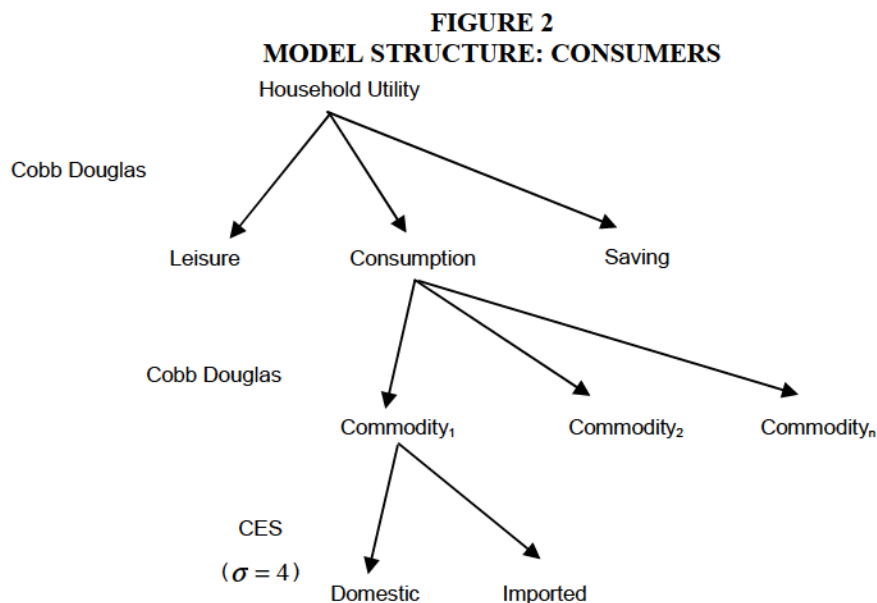
The model used in the document is relatively standard but it distances from the Heckscher-Ohlin paradigm by introducing product differentiation and informal labour that is an imperfect substitute of formal labour but only used in non-traded activities, besides it considers an education sector that it is publicly provided. Along the lines of this model, changes in local conditions, e.g. in the relative supply of qualifications, affect good and factor prices.

The households make a consumption-leisure choice, so that the labour supply is endogenous. The households also make the choice between working formally or informally. Households allocate their post-tax income between consumption goods: A (agriculture), B (manufacturing) and C (services). There are three tradable sectors (A, B and CT), a non-traded sector CNT and the public sector. Sector A and B are unskilled-intensive exporting activity, and sector C is a skilled-intensive activity with a low export orientation, partly of which is non traded. Traded sectors charge different prices in domestic and foreign markets (product differentiation by country). All production functions are subject to constant returns to scale. There are competitive markets for goods and factors. A detailed description of the model is presented in the Appendix.

**FIGURE 1**  
**MODEL STRUCTURE: PRODUCERS**



Source: Own elaboration.



Source: Own elaboration.

This model is relatively standard but it deviates from the HO paradigm by introducing product differentiation by country. Whereas in the standard model, endowment growth in a small open economy has no effect on prices and factor returns and changes in international prices are fully transmitted to domestic prices, in this model that introduces product differentiation by country, product and factor prices are affected by changes in local conditions (i.e., in the domestic supply and demand of skills). In a context where both local and international conditions determine relative wages, a (relatively) greater supply of skilled labour may drive the wages of that labour down, reducing the wage gap and favouring the substitution of unskilled for skilled labour. The starting point is that educational policies have a role in determining the outcome of the accumulation process by altering quantity, quality, and composition of the public supply of educational services. Then, the standard Rybczynski effect applies, with a shift in the production possibility frontier biased towards the sector intensive in the factor which grows relatively.

## B. Education sector and labour market

The theoretical aspects of the education sector are described to ease the interpretation of the simulation exercises, but the effects of changes in education policy will be taken as exogenous; this is a simple modelling strategy, which, nevertheless, is enough to make the point on the economy-wide effects of inefficient education sectors and their policy implications.

Education is publicly provided; the demand side is implicit in the assumption that students exit the system when the quality of education they receive is poor. The output of education activities results from the combination of resources and students for a given technology,  $Q_j = F_j(G_j, E_j)$ , where subindex  $j = B, H$  indicates the level (basic or higher education);  $G_j$  are resources;  $E_j$  are students;  $Q_j$  is the output of the activity, and  $F_j$  is a constant returns-to-scale function. The output per student  $q_j = Q_j / E_j = f(g_j)$ , where  $g_j$  is the resource intensity per student, measures “school quality,” which is an output measure of quality (embodied knowledge per student) following Hanushek (1979). Student attainment, which reflects school quality, is taken as the determinant of dropouts, so the dropout rate is defined as  $\theta_j = \theta_j(q_j)$  where  $\partial\theta_j / \partial q_j < 0$ . So, poor school quality leads to students’ poor performance

and early exit. This also leads to inefficiencies in the expenditure of education measured by completion rates.

So, the timing of exit from the educational system determines the composition of new workers into the labour market: it is assumed that those who drop out from basic education enter the market as unskilled labour, those with complete basic education or incomplete higher education enter the labour market as semi-skilled labour, while those who complete higher education enter the labour market as skilled workers. The central point here is that efficiency of the education system (completion rates) determines the pattern of endowment growth.

Thus, the composition of the inflow of new workers is given by

$$dLT_U = \theta_B E_B$$

$$dLT_M = \theta_H E_H$$

$$dLT_S = (1 - \theta_H) E_H$$

where  $\theta_B$  and  $\theta_H$  are the exit rates at basic and higher level respectively. So,  $dLT_S$ ,  $dLT_M$ , and  $dLT_U$  represent the inflow of skilled, medium skilled, and unskilled workers, respectively, which determines the pattern of endowment growth. Thus, the rate of endowment growth in the economy is given by

$$\hat{L}_S = dL_S / L_S$$

$$\hat{L}_M = dL_M / L_M$$

$$\hat{L}_U = dL_U / L_U$$

where  $L_S$ ,  $L_M$ , and  $L_U$  are the stocks of skilled, medium-skilled, and unskilled labour, respectively, and a hat (^) placed over the variables denotes rate of growth.

So, in the model, higher education quality is associated with lower rates of early dropouts, which improves the systemic performance of educational systems and increases the productivity of the expenditure in education measured by completion rates. As the rates of early dropouts are lowered, the composition of the inflow of new workers will shift towards the higher qualified types. The approach followed in the modelling of the education sector considers that quality is the determinant of the time of exit, but it does not consider explicitly the quality of education received once the individual is in the labour market. This is not necessary to make the point, which is to show that considering the current situation of the education sector and the demand from productive activities, the mismatch between creation and demand of types of labour (measured by years of schooling) is likely to worsen; however, the long-term results may drastically vary according to alternative education policies aimed at reducing dropouts, which change the composition of the inflow of new workers. Thus, the focus will be made on the hypothesis that improving the matching between creation of and demand for skills, by enhancing skills formation, will favour the expansion of dynamic sectors, allowing them to take advantage of the opportunities open in the global economy.



### **III. The Uruguay situation**

#### **A. The education sector**

The “Education For All (EFA) by 2015” goal, set by UNESCO in 2000, focuses on the expansion of early childhood education, the achievement of universal primary schooling, the development of learning opportunities for youth and adults, the expansion of literacy, the achievement of gender parity in education, and improvements in the quality of education. In the global context, the situation of Uruguay is not bad: many years ago, it had already achieved universal primary education and gender parity, and a more recent achievement is expansion of early childhood education, reaching universal coverage of 5-year-old children (pre-schooling level) in 1999. However, there are other problematic areas in Uruguay’s educational system, for which the authorities are still trying to find a solution, for example, the low performance at the secondary education level.

In Uruguay, the dominant provider at all levels of education is the public sector, as it is shown in Table 1. This ensures that students have equal opportunities of having access to the whole education cycle, which is not restricted in any way, either by charging fees or by selection processes, even at the tertiary level. But, according to the data of the Ministry of Education (MEC, 2008), coverage is very different across levels. The coverage at the primary level is high, 93.2% (among population aged 14-15), but the coverage at higher levels is much lower. At lower secondary, only 64.3% complete the level (among population aged 17-18), and at higher secondary, completion rate is as low as 34.8% (among population aged 21-22). Actually the problematic situation starts at the lower secondary level where not only 64.3% of students complete the level, even when it is compulsory, but also where the gap with developed countries starts to widen from this level upwards.

**TABLE 1**  
**PUBLIC-PRIVATE PARTICIPATION, BY EDUCATION LEVEL**  
*(In percentage)*

	Public	Private	Total
Pre-primary	67.5	32.5	100
Primary	74.6	25.4	100
Lower secondary	85.1	14.9	100
Upper secondary	86.1	13.9	100
Tertiary non-university	99.4	0.6	100
University	85.0	15.0	100

Source: MEC (2008).

Moreover, the coverage is very unequal across socioeconomic groups. Table 2 shows, for selected ages, that coverage does not differ much across socioeconomic groups at the primary level, but it does differ much at the higher levels. For instance, for lower secondary, while almost all in the highest quintile complete this level (95.9%), less than half do so in the lowest quintile (42.8%). The situation is even more unequal for the upper secondary education: whereas 76.5% of the richest people complete the level, only 10.7% of the poorest achieve that. Unequal distribution of coverage adds another dimension to the problem of early dropouts from the educational system.

**TABLE 2**  
**EDUCATIONAL ATTAINMENT, BY INCOME QUINTILES**  
**AND SELECTED AGES, URUGUAY**

Quintile	Aged 14-15 with complete primary	Aged 17-18 with complete lower secondary	Aged 21-22 with complete higher secondary
1	88.5	42.8	10.7
2	95.5	64.4	25.6
3	97.8	79.0	35.5
4	98.6	84.7	52.9
5	99.7	95.9	76.5
Total	93.4	64.3	34.8

Source: MEC (2008).

This leads to a different composition of income groups by educational attainment. Table 3 shows that, whereas the major part of the lowest quintile (53.3%) has only primary education, the major part of the highest quintile (55%) has tertiary education.

**TABLE 3**  
**COMPOSITION BY EDUCATIONAL ATTAINMENT (COMPLETE OR INCOMPLETE)**  
**IN EXTREME INCOME QUINTILES, URUGUAY**

Quintile	Lowest quintile	Highest quintile
Primary	53.3	6.7
Secondary	43.2	38.2
Tertiary	2.0	55.0
Total	98.5	99.9

Source: MEC (2008).

The above information shows important shortcomings in the Uruguay's educational system. The focus of this paper is to discuss how these shortcomings could/would affect the long-term Uruguayan economic performance.

## B. Education, labour market, trade and production

This section describes productive sectors in Uruguay in order to link the analysis of education, skills, and trade. For this purpose, some basic indicators are computed using 2005 data. To start with, workers are classified according to schooling level: a) unskilled: incomplete basic education (less than 9 years of schooling); b) medium-skilled: complete basic education and higher education incomplete (9 to 15 years); and c) skilled: 16 years or more, corresponding to a university degree (with a degree of an average length of 4 years) or further studies.

At the aggregate level, as can be seen in Table 4 panel a, the services sector is the main employer in the Uruguayan economy: almost all skilled workers are employed in this sector (93%). Panel b of Table 4 shows that unskilled workers account for 40% of the employment, but the composition of the sectors, by type of labour, differs: whereas the participation of skilled labour is 16% in the services sector, it is only 4% in the goods sector. The table shows that a consideration of more than two skill levels is relevant to better describe the characteristics of employment across sectors; in particular, it shows that the participation of medium-skilled labour is high and similar across sectors.

**TABLE 4**  
**COMPOSITION OF EMPLOYMENT, BY LABOUR TYPE AND SECTOR**  
*(In percentage)*

Panel a				
	Unskilled	Semi-skilled	Skilled	Total
Goods	31	20	7	23
Services	69	80	93	77
Total	100	100	100	100
Panel b				
	Unskilled	Semi-skilled	Skilled	Total
Goods	54	42	4	100
Services	35	49	16	100
Total	40	47	13	100

Source: Own elaboration on processed data from INE.

As Table 5 shows, the services sector is mainly oriented to the domestic market, accounting for only 18% of the country's exports, about half of which correspond to transport and travel, which is 16th in the ranking of sectors by skill content. Thus, as goods account for 82% of the exports, the Table 4 panel b data reveal that the most important pressure coming from external demand is on intermediate qualified workers rather than on the most skilled.

**TABLE 5**  
**EMPLOYMENT, PRODUCTION, AND EXPORT, BY SECTOR**  
*(In percentage)*

	Employment	GDP	Export
Goods	23	25	82
Services	77	75	18
Total	100	100	100

Source: Own elaboration with data from BCU and processed data from INE.

At a more disaggregated level, we can refine the analysis. Table 6 shows the 15 major contributors to total exports, ranked by share of each sector in total exports, and also the corresponding ranking position for several other variables. The first column of the table is the ranking by exports, the second is the position in the ranking of shares in total employment, the third shows the position in the ranking according to the sector content of skilled labour (15 or more years of education), and the last one shows the position in the ranking of contributors (shares) to GDP.

The table shows that, among the 15 top exporting sectors, 1) there are three sectors from the services group: transport and travel, information technologies (IT) and research and development (R&D)-related activities, and financial services; and that 2) there are three of the top five skilled labour-intensive sectors: IT and R&D-related activities, financial services, and oil refinery.

The general picture will be more complete with a table presenting a different selection of sectors. Table 7 selects the 15 sectors with more skill content, which ranking is shown in the first column. In the rest of the columns, as in the previous table, the rankings in GDP, exports, and employment are given. The ranking of the sectors with more skill content shows that 1) eight (out of 15) sectors included are services; 2) the sectors with more skill content are almost non-traded: teaching activities and health and social services; 3) seven out of the top 10 contributors to the GDP are included in the list; 4) only two of the top 10 contributors to exports (financial services and oil refinery) are included in the list.

**TABLE 6**  
**RANKING POSITIONS BY SEVERAL VARIABLES OF TOP 15 EXPORTING SECTORS**

	Exports	Employment	Skill content	GDP
D.1511.0 Meat production and processing	1	19	39	21
I.RRTT.0 Transport and travel	2	17	15	17
D.23TT.0 Oil refinery	3	40	5	20
D.19TT.0 Leather products	4	24	41	37
D.1520.0 Dairy products	5	26	24	24
D.154S.0 Sugar, cocoa, and confectionary	6	39	23	14
A.011T.0 Crops and related services	7	10	36	15
J.TTTT.0 Financial services	8	14	4	3
D.17TT.0 Textile production	9	22	30	26
D.153T.0 Mill production	10	33	40	35
D.151R.0 Processing of fish, fruits, vegetables, etc.	11	32	34	38
D.25TT.0 Rubber and plastic products	12	31	26	31
D.RRTT.0 Metals, machinery, and equipment	13	15	18	18
D.24UT.0 Other chemicals	14	35	14	29
K.RRTT.0 Rental equipment, IT, R&D, and others	15	7	3	9

Source: Own elaboration with data from BCU and processed data from INE.



**TABLE 7**  
**RANKING POSITIONS BY SEVERAL VARIABLES, SELECTING TOP 15 SECTORS**  
**BY SKILL CONTENT**

		Skill content	GDP	Exports	Employment
M.80TT.0	Teaching activities	1	10	40	5
N.85TT.0	Health and social services	2	6	41	3
K.RRTT.0	Rental equipment, IT, R&D, and others	3	9	15	7
J.TTTT.0	Financial services	4	3	8	15
D.23TT.0	Oil refinery	5	20	3	40
D.24ST.0	Pharmacy	6	36	20	29
L.75TT.0	Public administration and defence; administration of retirement funds	7	4	37	4
I.64TT.0	Telecommunications and postal services	8	7	25	19
E.TTTT.0	Electricity, water, gas	9	11	29	21
D.22TT.0	Printing and editing services	10	30	30	24
O.TTTT.0	Other community services	11	13	38	9
D.24RT.0	Fertilizers and chemicals for agriculture	12	43	31	43
K.70TT.0	Real estate	13	1	35	28
D.24UT.0	Other chemicals	14	29	14	34
I.RRTT.0	Transport and travel	15	17	2	18

Source: Own elaboration with data from BCU and processed data from INE.

**TABLE 8**  
**RANKING POSITIONS BY SEVERAL VARIABLES, SELECTING TOP 15**  
**CONTRIBUTORS TO GDP**

		GDP	Employment	Skill content	Exports
K.70TT.0	Real state	1	29	13	35
G.TTTT.0	Retailers, car servicing and similar services	2	1	19	39
J.TTTT.0	Financial services	3	14	4	8
L.75TT.0	Public administration and defence; administration of retirement funds	4	4	7	37
F.45TT.0	Building sector	5	6	32	40
N.85TT.0	Health and social services	6	3	2	41
I.64TT.0	Telecommunications and postal services	7	18	8	25
A.012T.0	Livestock and related services	8	28	21	24
K.RRTT.0	Rental equipment, IT, R&D, and others	9	7	3	15
M.80TT.0	Teaching activities	10	5	1	42
E.TTTT.0	Electricity, water, gas	11	20	9	29
I.60TT.0	Ground transport	12	9	31	28
O.TTTT.0	Other community services	13	8	11	38
D.154S.0	Sugar, cocoa, and confectionery	14	39	23	6
A.011T.0	Crops and related services	15	10	36	7

Source: Own elaboration with data from BCU and processed data from INE.

Table 8 shows the 15 major contributors to total GDP ranked and also the ranking positions for other several variables. Among the 15 major contributors to the GDP, there are six sectors listed in the top 10 of higher skill content (financial services, public administration and administration of retirement funds, health and social services, telecommunications and postal services, IT and R&D-related activities, and teaching activities), but only three top 10 exporters (financial services, sugar and confectionery, and crops and related services).

Finally, Table 9 lists the 15 fastest growing sectors during the period 1997-2005, measured by the annual accumulative rate of growth of GDP during the period. The table shows that, among the fastest growing sectors in the recent period, a) there are 5 of the top 10 major contributors to GDP (telecommunications and postal services, IT and R&D-related activities, livestock and related services, real estate, and teaching activities); b) there are 5 of the top 10 contributors to exports (sugar and confectionery, meat processing, dairy products, crops and related services, and oil refinery); and c) there are 4 of the top 10 sectors with higher skill content (telecommunications and postal services, IT and R&D-related activities, oil refinery, and teaching activities).

**TABLE 9**  
**RANKING POSITIONS BY SEVERAL VARIABLES, SELECTING TOP 15 SECTORS, BY GDP GROWTH, 1997-2005**

		GDP growth	Employment	Skill content	GDP	Exports
D.154S.0	Sugar, cocoa, and confectionery	1	39	23	14	6
I.64TT.0	Telecommunications and postal services	2	18	8	7	25
D.25TT.0	Rubber and plastic products	3	31	26	31	12
D.20TT.0	Production of wood and wood products, except furniture	4	27	42	32	16
D.1511.0	Meat production and processing	5	19	39	21	1
D.24RT.0	Fertilizers and chemicals for agriculture	6	43	12	43	31
D.SSTT.0	Vehicles and transport equipment	7	37	25	34	18
K.RRTT.0	Rental equipment, IT, R&D, and others	8	7	3	9	15
D.1520.0	Dairy products	9	26	24	24	5
A.011T.0	Crops and related services	10	10	36	15	7
D.23TT.0	Oil refinery	11	40	5	20	3
A.012T.0	Livestock and related services	12	28	21	8	24
M.80TT.0	Teaching activities	13	5	1	10	42
D.151R.0	Processing of fish, fruits, vegetables, etc.	14	32	34	38	11
K.70TT.0	Real estate	15	29	13	1	35

Source: Own elaboration with data from BCU and processed data from INE.

The previous tables allow us to draw an initial general picture of the link between skill formation, trade, and growth. This can be summarized as follows:

- (i) In the Uruguayan economy, the services sector is the main employer, and almost all skilled workers are employed in this sector (93%).
- (ii) The services sector is mainly oriented to the domestic market, accounting for only 8% of the country's exports, about half of which correspond to transport and travel, which is 15th in the ranking of skill-intensive sectors.
- (iii) However, among the 15 top exporting sectors, there are three of the top five skill-intensive sectors: rental equipment, IT, R&D and-related services, financial services, and oil refinery.
- (iv) In the list of the 15 major contributors to GDP, there are six of the top 10 skill-intensive sectors; between the faster growing sectors in the 1997-2005 period, measured by the annual accumulative rate of GDP growth, there are four out of the top 10 sectors with higher skill content.

All these then show that the skills are relevant to both exporting and non-exporting enterprises, with an important role to induce growth, given the performance of the dynamic sectors. Finally, to draw a stylized picture of the Uruguayan economy, based on which the simulations will be

better analysed, Tables 10 and 11 present data in the main sectors: primary, manufacturing and services traded and non-traded. Table 10 shows the scarce participation of skilled labour in the primary and manufacturing sectors but the highest involvement in the traded services sector.

**TABLE 10**  
**EMPLOYMENT COMPOSITION OF AGGREGATED SECTORS**  
(Percentage)

	Unskilled	Semi-skilled	Skilled	Total
Primary	69	27	4	100
Manufacturing	44	52	5	100
Services traded	28	53	20	100
Services non-traded	37	48	15	100
Total	40	47	13	100

Source: Own elaboration based on SAM 2005 (see Terra et al. 2009).

**TABLE 11**  
**PROFILE OF AGGREGATED SECTORS**  
(Percentage)

	Employment	Skill content	GDP	Exports
Primary	9	5	8	7
Manufacturing	13	8	17	74
Services traded	15	25	22	18
Services non-traded	63	20	54	1

Source: Own elaboration based on data from: SAM 2005 (see Terra et al. 2009), Uruguayan Central Bank (BCU) and National Census Bureau (INE).

Finally, Table 11 highlights the relevance of non-traded services to employment (almost two-thirds) and GDP (more than a half), while the participation of manufacturing in exports is dominant (three-fourths).



## IV. Scenarios and assumptions

The simulation exercise aims to highlight the relevance of educational policies to mediate the effects of trade policy or global trends on productive activities. There follows a hypothetical experiment where the economy follows different patterns of endowment growth in order to investigate the way in which these affect the results. The exercise simulates changes in the composition of the inflow of workers delivered to the market; the underlying assumption is that differences in the patterns of endowment growth are explained by different educational performances/policies.

The benchmark for this simulation is a skill-scarce country with skill-intensive services sectors producing mainly for the domestic market. However, skill-intensive services have become increasingly traded globally and Uruguayan exports have followed that trend. The sector is under a liberalization process after the Uruguay Round; the potential of economy-wide effects of trade liberalization on services are reviewed, for instance, by Hoekman (2006). The novelty of this non-traditional export in developing countries is that, in general, it involves skill-intensive activities (e.g., banking, insurance). Thus, the increasing trend in external demand for services from developed countries is simulated for an alternative pattern of endowment growth. The exercise consists of a simulation of external demand for services in alternative scenarios of endowment growth, which is described below.

### A. Increase in the external demand for services

According to WTO (2008) data, growth rates of aggregate sectors during the period 2000-2007 are:

**TABLE 12**  
**WORLD EXPORT GROWTH RATES**  
*(In percentages)*

	2000-2007
Agriculture	4
Oil and mining	3.5
Manufacturing	6.5
Services traded	12

Source: International Trade Statistics, 2008, World Trade Organization.

So, we projected growth rates for a time horizon of 20 years as follows:

**TABLE 13**  
**PROJECTED RATES OF GROWTH FOR NEXT 20 YEARS**

	2005-2025
Primary	119
Manufacturing	221
Services traded	865

Source: Own elaboration.

In the group of traded services are included the following activities:

**TABLE 14**  
**LIST OF TRADED SERVICES**

H55TT0	Hotels and restaurants
I60TT0	Ground transport
I64TT0	Telecommunications and postal services
IRRTT0	Transport (air and maritime) and travel
JTTTT0	Financial services
KRRTT0	Rental equipment, IT, R&D, and others

Source: Own elaboration based on export orientation.

## B. Exogenous endowment growth

For labour, we assumed a projected growth of the active population at 10% based on projections for 2005-2025 from INE. The increment for capital was projected taking the average rate of growth in the last 20 years, which is a conservative estimate, given that, based on the average gross investment growth rate in the last 10 years (1998-2008, data from BCU), the projected growth would be higher.

Three alternative scenarios of endowment growth are considered according to the mix of workers produced by the educational system (the total increase of labour is the same in all the alternatives). For a time horizon of 20 years, the following values for the different scenarios are considered:

**TABLE 15**  
**ENDOWMENT GROWTH: TIME HORIZON OF 20 YEARS**

	ESC0	ESC1	ESC2
Skilled	10%	21%	10%
Semi-skilled	10%	5%	21%
Unskilled	10%	10%	3%
Capital	20%	20%	20%

Source: Own elaboration.

In the base scenario (Escenario 0, ESC0), we assumed that the projected increase in all types of labour is the same as that in the population; the other scenarios assume alternative patterns. The basic assumption is that alternative patterns of labour growth are policy-induced: a policy of enhancing higher education (so, reducing dropouts and consequently favouring the formation of skilled labour-ESC1) and a policy of enhancing basic education (thus reducing dropouts at the basic level and consequently reducing unskilled labour and increasing medium-skilled labour-ESC2) are the basic policies underlying Scenarios 1 and 2.

**TABLE 16**  
**COMPOSITION OF THE INFLOW OF WORKERS**  
*(In percentage)*

	ESC0	ESC1	ESC2
Skilled	16	35	16
Semi-skilled	33	15	70
Unskilled	50	50	14

Source: Own elaboration.





## V. Simulation results

The focus of the comments on the simulation results will be on the effects of the shock on the labour market and the productive sector, and these results will be compared with those obtained for alternative (assumed to be policy-induced) patterns of endowment growth.

Table 12 shows the effects of the shock on wages, with and without education policy. Column 3 displays the marginal effect between a situation with and without an external shock, which reveals that it will rise the relative return of medium-skilled and skilled wages, increasing the wage gap with the unskilled. Columns 4 and 5 of the same table compare the results of the shock under alternative patterns of endowment growth compared with those if the economy follows today's trend (status quo), presenting the resulting marginal effects with respect to ESC0 (column 2). These results show that, if the production of skills is enhanced, this will reduce the wage gap, both in the alternative where the skilled labour is favoured (column 4 ESC1, enhancing higher education, thus reducing dropouts) as its return declines, and also in the alternative where medium-skilled labour is favoured (column 5 ESC2, enhancing basic education, thus reducing dropouts and unskilled labour) as the return of unskilled labour rises.

**TABLE 17**  
**RISE IN EXTERNAL DEMAND FOR SERVICES – EFFECT ON WAGES**

	(1)	(2)	(3)	(4)	(5)
	ESC0	ESC0	Marginal	ESC1	ESC2
	without	with shock	(2)-(1)	Growth skilled	Growth medium
	shock			biased	skilled
				biased	biased
$w_u$	3.0	17.1	14.1	0.1	7.2
$w_m$	2.5	20.2	17.7	4.4	-7.8
$w_s$	1.7	19.1	17.3	-8.3	0.6

Source: Own elaboration based on simulation results.

Notation  $w$  are wages.  $u$ ,  $m$ , and  $s$  refer to unskilled, medium-skilled, and skilled labour, respectively.

Table 13 shows the effects of the shock on the output of productive sectors, also with and without education policy. Column 3 shows that the projected expansion of the external demand will bias growth mainly towards traded services, against the primary sector. Columns 4 and 5 display the marginal effects if the patterns of endowment growth were to change: as expected, growth in skilled or

medium-skilled will favour the expansion of services, which use those factors more intensively. This shows that any alternative pattern of endowment growth different from the status quo will ease the expansion of the production of services, in particular those traded, allowing them to take advantage of the global trends in growth of trade. On the contrary, it can be deduced that a pattern of endowment growth along the lines of the country's comparative advantage ("the status quo mode") promotes the expansion of traditional competitive sectors but with more inequality as seen in Table 12.

**TABLE 18**  
**RISE IN EXPORT OF SERVICES – EFFECT ON OUTPUT OF PRODUCTIVE SECTORS**

	(1) ESC0 without shock	(2) ESC0 with shock	(3) Marginal (2)-(1)	(4) ESC1 Growth skilled biased	(5) ESC2 Growth medium skilled biased
Primary	15.1	1.0	-14.2	-0.5	-1.2
Manufacturing	15.2	19.7	4.5	-0.7	1.0
Services traded	14.2	55.4	41.2	0.5	5.0
Services non-traded	14.1	22.9	8.9	0.0	2.2

Source: Own elaboration based on simulation results.

Table 14 shows the effect of the shock on exports, with and without education policy. Column 3 of shows that the shock results in a dramatic growth of services exports. This is even reinforced when alternative patterns of endowment growth are more skill-intensive than the status quo, as can be seen in columns 4 and 5, in particular, when the production of medium-skilled labour is enhanced (ESC2) as these activities are mainly intensive in medium-skilled labour (53% on average, see Table 10).

**TABLE 19**  
**RISE IN EXTERNAL DEMAND OF SERVICES – EFFECT ON EXPORTS**

	(1) ESC0 without shock	(2) ESC0 with shock	(3) Marginal (2)-(1)	(4) ESC1 Growth skilled biased	(5) ESC2 Growth medium skilled biased
Primary	14.3	-17.8	-32.2	-0.3	-2.5
Manufacturing	13.0	38.1	25.1	-0.9	-0.3
Services traded	13.5	291.0	277.5	1.4	16.4

Source: Own elaboration based on simulation results.

At a more aggregated level, the effects of the shock on GDP are presented in Table 15, which shows a marginal effect of the shock on GDP of around 5%. However, this effect can vary substantially according to alternative policies. While the policy under scenario 1 will have an almost negligible effect on GDP, the policy of enhancing the production of semi-skilled labour will produce a significant marginal expansion of GDP by an additional 2 percentage points due to a broad use in the economy of that factor.

**TABLE 20**  
**RISE IN EXTERNAL DEMAND OF SERVICES – EFFECT ON GDP**

	(1) ESC0 without shock	(2) ESC0 with shock	(3) Marginal (2)-(1)	(4) ESC1 Growth skilled biased	(5) ESC2 Growth medium skilled biased
GDP	14.3	19.7	5.3	0.1	2.1

Source: Own elaboration Own elaboration based on simulation results.

The analysis at the disaggregated level will provide more insights on the effects of the shock on the activities in the traded services sector. Table 16 presents the effects on output with and without the shock and the marginal effects in column 3 displayed ranking in descending order. The table shows the greatest impact of the rise in external demand for traded services on transport-related activities, especially those by air and sea, followed by financial services and IT and R&D- related activities.

**TABLE 21**  
**RISE IN EXTERNAL DEMAND OF SERVICES – EFFECTS ON OUTPUT**  
*(Disaggregated results)*

		(1)	(2)	(3)	(4)	(5)
		ESC0	ESC0	Marginal	ESC1	ESC2
		without	with	(2)-(1)	Growth	Growth
		shock	shock		skilled	medium
					biased	skilled
						biased
IRRTT0	Transport (air and maritime) and travel	15.8	197.9	182.1	-3.0	10.4
I60TT0	Ground transport	12.5	40.2	27.6	-2.0	3.2
JTTTT0	Financial services	15.1	39.5	24.4	1.2	5.8
KRRTT0	Rental equipment, IT, R&D, and others	14.8	28.2	13.4	6.9	6.2
H55TT0	Hotels and restaurants	12.1	21.3	9.2	-0.9	2.1
I64TT0	Telecommunications and postal services	14.8	20.9	6.1	0.2	2.2

Source: Own elaboration Own elaboration based on simulation results.

Columns 4 and 5 of Table 15 show the effect of the shocks under policies different from the status quo. It implies that any policy aimed at upgrading the quality of the labour force will enable a greater expansion of IT and R&D-related activities and financial services, both of them skill-intensive activities among the traded services. However, a policy oriented to enhancing the production of medium-skilled labour (ESC2) will favour the expansion of all the activities, as this type of labour is used heavily in all sectors.



## VI. Conclusions

At the global level, trade in services has been the most dynamic sector, with an average growth rate about double that in the primary and manufacturing sectors. However, the three activities have a completely different composition in terms of type of labour, services being the most skill-intensive. In Uruguay, the formation of human resources shows several weaknesses; which leads one to ask: Is Uruguay prepared to take advantage of the opportunities open in the global market? If not, what are the consequences?

The situation of the Uruguayan education sector and the characteristics of the labour market were described in the paper. On one hand, a problem at the secondary level of the education sector was identified, where only two-thirds of individuals complete a compulsory level. On the other hand, the description of the labour market shows a very different composition of the goods and services sector by labour type: on average, services are more skill-intensive than the goods-producing sectors, but pressure on the demand for medium-skilled labour is similar in both groups.

The analysis of the Uruguayan data on skills, trade, and growth shows some important facts. First, even when the main exporting sectors have a high content of unskilled labour, there are some skill-intensive sectors with a high exporting profile, for which the development of human resources is a key element in the context of increasing external demand. Second, as all sectors demand a significant share of semi-skilled labour, it seems that there is a great pressure coming from the external demand for intermediate qualified workers. Third, some of the skill-intensive sectors have shown dynamism in recent years and are included in the list of the fastest growing sectors, which is independent of external demand. So, the analysis of the data shows that both skilled and medium-skilled labour are key factors for growth, resources that are deficient in Uruguay as the paper has described.

A simulation exercise was tried consisting of an increase in external demand for skill-intensive services, following the global trend of trade in services and the increasing participation of Uruguay in such trade. The pressure on relative wages and factor allocation was the focus of the simple exercise. It is shown that, in this scenario, the wage gap would widen should the pattern of endowment growth follow the current trend; however, changes in such a pattern towards more participation of skilled or semi-skilled labour would favour a reduction in the wage gap. The simulation may well represent episodes of rises in demand not met by increases in supply, often cited as the cause of the increase in the skill premium in many Latin American countries.

The results of the exercise suggest several lines for a deeper analysis. The results show that, in a context where the educational system does not improve its performance, the scenario of increasing

external demand for services leads to an increase in the wage gap across qualifications. But this is not a necessary result. Educational policies aiming at improving the efficiency of the education sector will contribute to a better matching between demand and supply of qualifications, allowing the expansion of dynamic sectors with a reduction in inequality. The logic of the exercise is to provide some insights on the economy-wide effects of a novel global phenomenon such as the expansion of trade in services; however, the scenarios may be relevant to other external shocks (e.g., changes in commodity prices) or other domestic policies such as the promotion of (“somehow defined”) strategic sectors.

## Bibliography

- Avalos, A. and Savvides, F. (2003), On the determinants of the wage differential in Latin America and East Asia: Openness, technology transfer and labour supply. Latin America/Caribbean and Asia/Pacific Economics and Business Association. Working Paper 19.
- Behrman, J., Birdsall, N. and Székely, M. (2007), Economic policy changes and wage differentials in Latin America. *Economic Development and Cultural Change* 56 (1): 57-97.
- Birdsall, N., Ross, D., and Sabot, R. (1995), Inequality and growth reconsidered: Lessons from East Asia. *The World Bank Economic Review* 9 (3): 477-508.
- De Ferranti, D., Perry, G., Gill, I., Guasch, J., Maloney, W., Sanchez-Paramo, and C. Schady, N. (2003), Closing the gap in education and technology. World Bank Latin American and Caribbean studies, The World Bank.
- Hanushek, E. (1979), Conceptual and empirical issues in the estimation of educational production functions. *Journal of Human Resources* 14 (3): 351-388.
- Harris, R. (1984), Applied general equilibrium analysis of small open economies with scale economies and imperfect competition. *American Economic Review* 74 (5): 1016-1032.
- Heckman, J. and Masterov, D. (2004), Skill policies for Scotland. The Allander Series.
- Hoekman, B. (2006), Liberalizing trade in services: A survey. World Bank Policy Research Working Paper 4030. The World Bank.
- Janeba, E. (2000), Trade, income inequality, and government policies: Redistribution of income or education subsidies? NBER Working Paper 7485.
- Laens, S. and Terra, I. (1999), Efectos del perfeccionamiento del MERCOSUR sobre el mercado de trabajo de Uruguay: Un ejercicio de simulación usando un CGE. *Revista de Economía, Banco Central del Uruguay*, 7 (2).
- MEC (2008), Anuario estadístico de educación 2007. Ministry of Education and Culture, Montevideo, Uruguay.
- Paus (2003), Productivity growth in Latin America: The limits of neoliberal reforms. *World Development* 32 (3): 427-445.
- Perry, G. and Olarreaga, M. (2006), Trade liberalization, inequality and poverty reduction in Latin America. Paper presented at ABCDE, San Petersburg, January.
- Razzak, W. and Timmings, C. (2008), A macroeconomic perspective on skill shortages and the skill premium in New Zealand. *Australian Economic Papers*, March: 74-91.
- Sanchez, C. and Schady, N. (2003), Off the running? Technology, trade and rising demand for skilled workers in Latin America. Policy Research Working Paper Series 3015. The World Bank.
- Terra, I., Doneschi, A. and Zaclicever, D. (2009), Construcción de la matriz de contabilidad social de Uruguay 2005. ECLAC Working Paper Series.
- Turrini, A. (1998), Endogenous education policy and increasing income inequality between skilled and unskilled workers. *European Journal of Political Economy* 14: 303-326.
- WTO (2008), International trade statistics, 2008. World Trade Organization.