Documentos de Trabajo

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Abstract

The paper discusses the links between skill requirements in the labour market and trade patterns using a CGE applied on the SAM 2005 for Uruguay. The results for alternative scenarios in the long term show that, the wage gap would widen should the pattern of trade growth follow the current trend; however, an enhanced demand of commodities would favour a reduction in the wage gap. The exercises provide insights on the economy-wide effects in the long term of the interaction of trade and accumulation of skills, and thus on the role of the current policy of development of human resources.

Keywords: trade, skills
JEL Classification: F16, F17

Resumen

Este trabajo analiza los vínculos entre los requerimientos de trabajo y los patrones comerciales usando un Modelo de Equilibrio General Computable aplicado a la Matriz de Contabilidad Social de Uruguay de 2005. Los resultados obtenidos para escenarios alternativos en el largo plazo muestran que la brecha salarial se ampliaría en los próximos 20 años en caso que el comercio mundial crezca en el futuro siguiendo la tendencia actual, pero se reduciría si se reforzara la tendencia al crecimiento del comercio de los productos primarios ("*commodities*"). Este ejercicio permite mostrar los efectos en la economía de las interacciones entre las tendencias comerciales y la evolución del stock de factores, resaltando el rol "hoy" de las políticas de desarrollo de recursos humanos.

Palabras clave: comercio internacional, capital humano

1 INTRODUCTION

In the case of Uruguay, where exports use mainly unskilled labour and import-competing activities and services are more skill-intensive, adjustment to trade shocks have complex effects on the demand for different types of workers. For instance, during the 1990s, due to increased openness, import-competing activities contracted, while most traditional export activities grew moderately and the output of services grew vigorously. As reported by Vaillant and Casacuberta (2004) the effect of this adjustment on employment was that unskilled jobs were lost and, in spite of a low rate of growth in employment, medium and high skill jobs were created; thus, distributional effects of trade shocks are not straightforward.

This paper applies a model to discuss the links between skill requirements in the labour market and trade patterns, with a forward looking perspective. 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 of alternative trade patterns, in particular on productive sectors and on the wage distribution. The comparison of expected effects for alternative future scenarios could provide some hints on suitable policies for the development of human resources.

The paper has the following structure. Section 2 describes the Uruguayan situation in the education sector, labour market, and trade. Section 3 describes the general settings of the model, the scenarios and results. Finally, Section 4 concludes. There is an Appendix with complementary results.

2 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

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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 (covering 83% of total enrolment on average, MEC, 2008). 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. As a consequence, the maximum level of attainment in the population is significant below the developed world, as Table 1 shows. While in Uruguay for the population aged 25-24 the group with primary education or less is dominant, in the OECD countries, the biggest group correspond to those with upper secondary education.

Table 1 Educational attainment of the adult population by gender. Population aged 25 to 64 years, by highest level of education attained (percentages)

Country	Year	Gender	Primary or less	Lower secondary	Upper secondary	Tertiary education	Total
Uruguay	2004	Male	39	26	26	8	100
		Female	38	24	26	12	100
OECD mean	2005	Male	12	16	47	26	100
		Female	13	17	43	26	100

Sources: UNESCO/UIS WEI (www.uis.unesco.org/publications/wei2007); OECD countries: OECD 2007 (www.oecd.org/edu/eag2007)

b) Education, labour market, trade and production

This section describes the main indicators relating education, skills, and trade in Uruguay, using 2005 data. To start with, activities are grouped in main sectors: primary, manufacturing, traded services and non-traded services; in a second step data is analysed at a more disaggregated level (43 activities). Total labour is 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.

Table 1 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 with data from BCU and processed data from INE

Table 1 shows the scarce skilled content in the primary and manufacturing sectors but the highest involvement in the traded services sector. This table also reveals 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).

Table 2 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: Source: Own elaboration with data from BCU and processed data from INE

Table 2 shows the scarce participation of skilled labour in the primary and manufacturing sectors but the highest involvement in the traded services sector. On contrast, medium skilled labour is intensively used in all sectors. Given the fact that the services sector is

mainly oriented to the domestic market, it seems that the most important pressure coming from external demand is on intermediate qualified workers rather than on the most skilled.

At a more disaggregated level, we can refine the analysis. Table 3 lists the 15 fastest growing sectors during the period 1997-2005, measured by the annual accumulative rate of growth of GDP. The first column in this table displays the ranking position according to the rates of GDP growth; the second column display the position in the ranking of shares in total employment; the third one shows the position in the ranking according to the skill content (percentage of employment with 16 or more years of education); the fourth one shows the ranking of contributors (shares) to GDP; and the last one shows the position is the ranking by exports.

Table 3 Ranking positions by several variables, selecting top 15 sectors, by GDP growth, 1997-2005

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

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

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);

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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).

The previous tables allow us to draw an initial general picture of the link between skill formation, trade, and growth, which can be summarized as follows. In the Uruguayan economy, the services sector is the main employer of skilled workers, while this sector is mainly oriented to the domestic market. Between the faster growing sectors, in 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 those sectors.

3 THE MODEL: SIMULATIONS AND RESULTS

The Computable General Equilibrium (CGE) model is based on Laens and Terra (1999) with minor changes. Uruguay is assumed as a *"quasi small"* open economy, following Harris (1984). In the model, the labour supply is endogenous; all production functions are subject to constant returns to scale; and there are competitive markets for goods and factors. There is one representative household and there are four production factors and 43 activities. The model is calibrated using the Social Accounting Matrix 2005 for Uruguay (Terra et al. 2009).

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. 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.

a) Scenarios

The benchmark for this simulation is a skill-scarce country with skill-intensive services sectors producing mainly for the domestic market. As skill- intensive services have become increasingly traded globally and Uruguayan exports have followed that trend, the design of future scenarios will consider this aspect.

In the exercises the effects of alternative trends in trade patterns in the long term are simulated, considering a 20 years period (2005-2025). In this period, the projected rate of growth of total labour is 7%, corresponding a rate of 19% for skilled labour, 12% for medium skilled labour, and -3% for unskilled labour (see estimates in Doneschi and Patron, 2010); in the case of capital, the projection 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.

b) Exercises

According to WTO (2008) data, growth rates of aggregate sectors during the period 2000-2007 are: Agriculture 4%, Oil and mining 3.5%, Manufacturing 6.5%, and Services (traded) 12%. So, simulated rates for trade growth for a time horizon of 20 years (2005-2025) follow two alternative assumptions:

i- In the long term trade follows the trend shown in the recent period, so the simulations consider the following trade growth rates for the aggregated sectors: primary 119%, manufacturing 221%, and traded services 865%.

ii- The growth of the primary sector is accentuated in the future, assuming that commodity demand from emerging economies growth more rapidly than in the past. So the simulations consider the trade growth rates: manufacturing 221%, primary 238%, and traded services 865%. In the group of traded services are included the following activities: Hotels and restaurants; Ground transport; Telecommunications and postal services; Transport (air and maritime) and travel; Financial services; Rental equipment, IT, R&D, and others.

c) Results

The focus of the comments will be on the effects on the labour market and the productive sector, and these results will be compared with those obtained for alternative trade patterns in the long term, named Trend 1 (projections on recent trends: primary 119%, manufacturing 221%, and traded services 865%) and Trend 2 (projections assuming changes in trade patterns: manufacturing 221%, primary 238%, and traded services 865%).

Table 4 shows the effects of alternative shock on the output of productive sectors. The table shows, as expected, a vigorous positive effect on the services sector in both alternative shocks, being negative also in both cases for the primary sector even when Shock 2 assumes a very favourable scenario for this sector.

Table 4 Effect on output of productive sectors, alternative trade trends

Sectors	Trend 1	Trend 2
Primary	-14.4	-1.4
Manufacturing	4.0	2.7
Services traded	42.1	39.5
Services non-traded	8.9	9.1

Source: Own elaboration based on simulation results

Table 5 compares both shocks from a different angle, considering the effects on the wage distribution. The table shows that whereas the projection of current trends (Trend 1) will produce a widening in the wage gap, an expansion of demands more favourable to the country comparative advantage (Trend 2) will help to reduce the wage dispersion. This is so, as the share of unskilled labour in the stock tends to go down in the long term, while the demand for goods of the primary sector (an unskilled intensive sector) is assumed to get stronger in the long term in Trend 2.

Table 5 Effect on wages, alternative trade trends

Wages	Trend 1	Trend 2
Unskilled	15.0	15.9
Medium skilled	17.5	17.7
Skilled	16.6	16.6

Source: Own elaboration based on simulation results

Table 6 shows the effect of alternative shock on exports. Here there is a strong positive impact on exports on the services sector, and a positive and moderate effect on manufacturing, in both scenarios. However, alternative shocks have opposite effects for the primary sector, being positive only in the favourable case.

Table 6 Effect on exports, alternative trade trends

Sectors	Trend 1	Trend 2
Primary	-32.1	71.3
Manufacturing	24.4	20.6
Services traded	282.7	269.2

Source: Own elaboration based on simulation results

The analysis at the disaggregated level can provide more insights on the effects of the trade trends. In general the variation in effects on output across sectors is very big, as can be seen in the table in the Appendix, containing the results for the 43 activities. However, the effects of alternative trends are not very different in the majority of sectors as can also be seen in the same table.

Table 7 Sectors with the greatest differences in effects

Activities	Trend 1	Trend 2	2-1
Crops and related services	-2	28	30
Forestry and wood	-26	9	34
Fishing and related activities	-23	-16	6
Mining	-47	-40	7
Fertilizers and chemical for agriculture	18	35	17
Transport and travel	183	174	-9

Source: Own elaboration based on simulation results

Table 7 presents a selection of the activities where the differences in effects on output of both trends are biggest. Here it is shown that Trend 2 will favour most the activities of Crops and related services, Forestry and wood, and Fertilizers and chemicals for agriculture. However, the favourable effects on primary-related activities do not have strong negative effects on any sector, except Transport and travel.

4 CONCLUSIONS

The paper discusses the links between skill requirements in the labour market and trade patterns using a Computable General Equilibrium (CGE) model applied on the Social

Accounting Matrix 2005 for Uruguay (Terra et al, 2009). This model is used to investigate the long-term effects of alternative trade patterns on productive sectors and the wage distribution, with a forward looking perspective.

The analysis of the Uruguayan data on skills and trade 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.

Simulation exercises consider two alternative scenarios: the current trend in trade growth remains unchanged during the next 20 years; or, it is assumed that the demand for primary products (mainly food) during the next 20 years will grow more rapidly than in the past, due to the rising demand of emerging economies. It is shown that, the wage gap would widen should the pattern of trade growth follow the current trend; however, changes towards an enhanced demand of commodities would favour a reduction in the wage gap.

The results suggest several lines for analysis. The exercise provides insights on the economy-wide effects in the long term of the interaction of trade trends and evolution of endowment stocks. Trends in the stock of unskilled labour are inversely related to primary and secondary enrolments, so enhanced efficiency implies that the growth of skilled relative to unskilled labour would increase. So, long term results may be changed by the education policy. Considering the very different effects on factor allocation and returns in different scenarios, the exercise highlights the need of planning ahead the development of human resources, according to likely future scenarios.

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APPENDIX

Table Effects on output of alternative shocks (in percentages)

	Activities	Trend 1	Trend 2
A011T0	Crops and related services	-2	28
A012T0	Livestock and related services	-20	-20
A02000	Forestry and wood	-26	9
B05000	Fishing and related activities	-23	-16
CTTTT0	Mining	-47	-40
D15110	Meat production and processing	-16	-19
D151R0	Processing of fish, fruits, vegetables, etc.	-14	-17
D15200	Dairy products	-9	-11
D153T0	Mill production	13	11
D154R0	Bakery products	-3	-4
D154S0	Sugar, cocoa, and confectionary	-9	-13
D155T0	Beverages	-2	-4
D16000	Tobacco	-1	-3
D17TT0	Textile production	-17	-20
D18TT0	Cloth and fur	-14	-15
D19TT0	Leather products	28	25
D20TT0	Production of wood and wood products except furniture	-25	-28
D210T0	Paper products	-5	-7
D22TT0	Printing and editing services	4	3
D23TT0	Oil refinery	80	81
D24RT0	Fertilizers and chemical for agriculture	18	35
D24ST0	Pharmacy	-11	-12
D24UT0	Other chemicals	6	4
D25TT0	Rubber and plastic products	13	11
D26TT0	Other mineral products	-1	-2
DRRTT0	Metals, machinery, and equipment	-30	-31
DSSTT0	Vehicles and transport equipment	24	22
DUUTT0	Furniture	-11	-13
ETTTT0	Electricity, water, gas	-5	-6
F45TT0	Building sector	26	26
GTTTT0	Retailers, car servicing and similar	11	12
H55TT0	Hotels and restaurants	9	9
I60TT0	Ground transport	27	26
I64TT0	Telecommunications and postal services	6	5
IRRTT0	Transport and travel	183	174
JTTTT0	Financial services	26	23
K70TT0	Real state	3	2
KRRTT0	Rental equipment, IT, R&D, and others	16	14
L75TT0	Public administration and defence; administration of retirement funds	1	1
M80TT0	Teaching activities	1	1
N85TT0	Health and social services	7	7
OTTTT0	Other community services	5	5
P95000	Housekeeping	1	1

Source: Own elaboration based on simulation results