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Trade and Skills in Uruguay: Long Term Skill Requirements*

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Abstract
The paper discusses the links between skill requirements in the labour market and alternative trade patterns using a CGE applied on updated data 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 trends in trade and accumulation of skills, and thus on the role of the current policy of development of human resources.

Key words: trade, skills, development
JEL: F16, F17

Resumen
Se analizan los vínculos entre las capacidades que demanda el mercado laboral bajo patrones alternativos de comercio utilizando un modelo de equilibrio general computable (CGE) en base a datos actualizados del Uruguay. Los resultados muestran que, en el largo plazo, la brecha sala-

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rial se vería ampliada bajo el escenario de que el patrón de crecimiento del comercio siguiera la tendencia actual; sin embargo, una mayor demanda de materias primas podría favorecer una reducción de la brecha salarial. Los ejercicios realizados permiten conocer los efectos que sobre el total de la economía, y en el largo plazo, se derivan de la interacción de las tendencias en el comercio y la acumulación de capacidades, permitiendo de esta manera también analizar el efecto de las políticas actuales de desarrollo de recursos humanos.

Palabras Clave: Comercio, Capacidades, Desarrollo
JEL: F16, F17.

I. 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, and thus on skill premium. 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, the impact on employment as well as distributional effects of trade shocks are not straightforward.

This paper discusses 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 (SAM) 2005 for Uruguay (Terra et al; 2009), is used to investigate the long-term effects of alternative trade patterns, in particular on productive sectors and on the wage distribution. An important policy implication is that the comparison of expected effects for alternative future scenarios could provide hints on suitable policies for the development of human resources.

The paper has the following structure. Section II presents basic facts of the education sector, labour market, and trade in Uruguay. Section III describes the general settings of the model, the scenarios and results. Finally, Section IV concludes. There is an Appendix with complementary results.

II. 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 almost 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 example, the low performance at the secondary education level.

In Uruguay, the dominant provider at all levels of education is the public sector (with a share of 83% of total enrolment on average). 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, coverage is very different across levels. According to the data of the Ministry of Education (MEC, 2008) 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 only 64.3% of students complete the level even when it is compulsory; also the gap with developed countries is wide. 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 25-64 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	PRIMARY OR LESS	LOWER SECONDARY	UPPER SECONDARY	TERTIARY EDUCATION	TOTAL
URUGUAY	2004	39	25	26	10	100
OECD MEAN	**2005**	**13**	**17**	**45**	**26**	**100**

Sources: UNESCO/UIS WEI (www.uis.unesco.org/publications/wei2007)

b) Education, labour market, trade and production

This section describes the main indicators relating education, skills, and trade in Uruguay (2005 data). Two levels of grouping are considered: a) Activities are grouped into main sectors: primary, manufacturing, traded services and non-traded services; b) At a more disaggregated level a total of 43 activities are considered.

To describe the composition of sector employment by qualifications 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.

As shown in Table 2, the composition of employment by qualifications varies significantly across sectors, with scarce participation of skilled labour in the primary and manufacturing sectors but a higher share in the services sector. On contrast, medium skilled labour is intensively used in all sectors.

Also, there are important differences in other aspects of sectors' profile, as their share in GDP or in total employment and their export orientation, as it is shown in Table 3. This table reveals the relevance of non-traded services to employment and GDP (about three-fourths), 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: Own elaboration with data from BCU and processed data from INE

Table 3
Profile of aggregated sectors (percentages)*

	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

* All columns display shares (adding 100%) except Skill content, which refers to Table 2.
Source: Own elaboration with data from BCU and processed data from INE

At a more disaggregated level, we can refine the analysis. Table 4 lists the 15 fastest growing sectors over the 43 activities considered, during the period 1997-2005 (measured by the annual accumulative rate of growth of GDP). All columns in Table 4 display the position of each activity in different rankings. The first column displays the ranking position in GDP growth; the second column display the position in the ranking of contributors (shares) to 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 in the ranking of main exporters.

Table 4
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	26
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 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). Besides: 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); and 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). So, among dynamic sectors are exporting, non-traded, as well as skill intensive activities.

The previous lines allow drawing 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. Also considering the fact that all sectors demand heavily intermediate qualified workers, it seems that the most important pressure coming from external demand is on intermediate qualified workers rather than on the most skilled.

Nevertheless, there are some skill intensive sectors with an export orientation, and it is noteworthy that between the faster growing sectors in 1997-2005, 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 those sectors.

III. THE MODEL: SIMULATIONS AND RESULTS

The Computable General Equilibrium (CGE) model is based on Laens and Terra (1999). This model is relatively standard but it deviates from the H-O paradigm by introducing product differentiation by country, so, whereas in the standard model, 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 (e.g. supply and demand).

In the model 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 activities are classified using the Table of Use and Supply (COU, for its initials in Spanish) elaborated by the Central Bank of Uruguay, who recently published data for the period 1997-2005 with this classification, nevertheless. the Central Bank provided additional information that allowed to work at a higher level of disaggregation in this article.

The general structure of the model is presented in figures 1 and 2. The model is calibrated using the Social Accounting Matrix (SAM) 2005 for Uruguay (Terra et al. 2009).

Figure 1

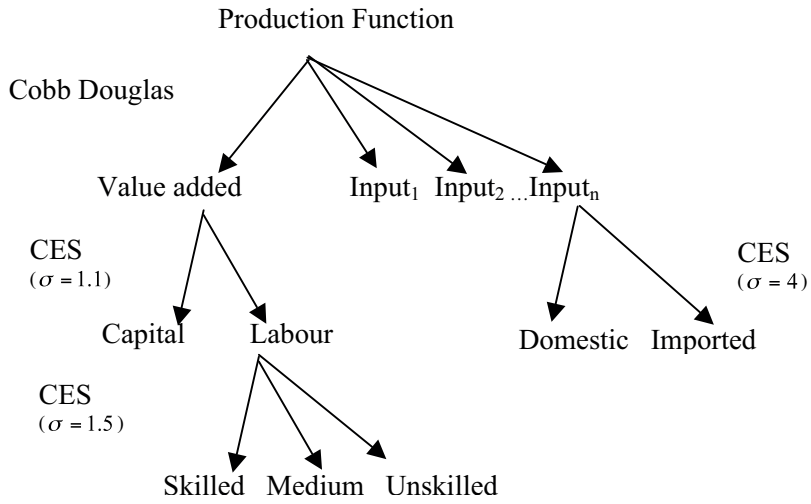
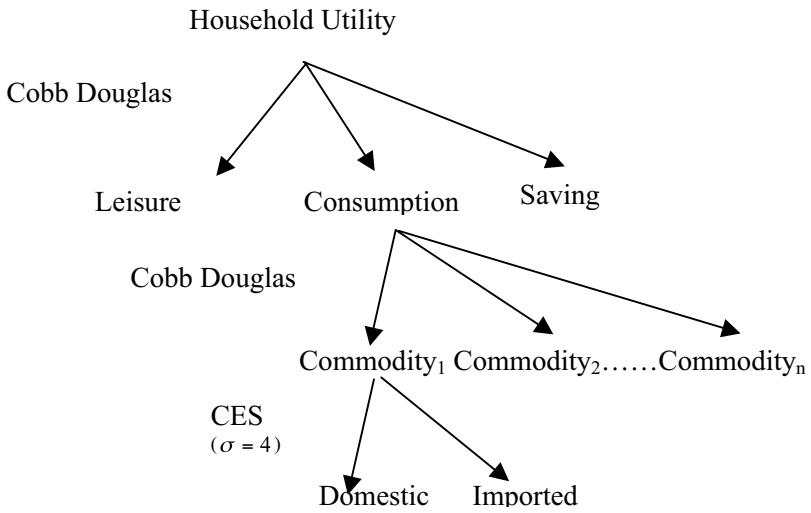


Figure 2



a) Scenarios

The benchmark for the simulation exercises 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 alternative scenarios consider this aspect in particular.

For the simulation exercises a 20 years period (2005-2025) is considered. In this period, the projected accumulated growth of labour is 7% (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 an accumulated rate of 20%, 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. Each scenario assumes alternative trends in trade patterns in the long term (Scenarios 1 and 2, see below).

b) Exercises

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

i) Scenario 1: In the long term trade follows the recent observed trend shown, so the simulations consider the trade accumulative growth rates: primary 119%, manufacturing 221%, and traded services[1] 865%.

ii) Scenario 2: It is assumed that growth of the primary sector is accentuated in the future due to rising commodity demand from emerging economies more rapidly than in the past. So the assumed trade accumulative growth rates are: manufacturing 221%, primary 238%, and traded services 865%.

The effects of trade on the labour market and the productive sector for alternative trade patterns in the long term, are discussed for Scenario 1 (projections on recent trends) and Scenario 2 (projections assuming changes in trade patterns).

1. 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 effects of alternative trade shocks on the output of productive sectors are shown in Table 5, which displays the accumulated effect during the period (20 years) on the output of productive sectors. The table shows, as expected, a vigorous positive effect on the services sector in both alternative Scenarios, revealing very promising expansion opportunities for traded services. However, expectations for the primary sector are negative in both alternatives, even when Scenario 2 assumes a very much more favourable scenario for this sector, probably revealing harsh competition for available resources in a very dynamic external context.

Table 5
Effect on output of productive sectors (percentage change 2005-2025)

SECTORS	SCENARIO 1	SCENARIO 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

The situation is relatively similar in Table 6 which shows the accumulated effect of alternative Scenarios on exports, where it is revealed strong positive impact on exports on the services sector, and a positive and moderate effect on manufacturing, in both scenarios, but negative for the primary sector, probably also to pressure on factors. Alternative Scenarios have opposite effects for the primary sector, being positive only in the more favourable case.

Table 6
Effect on exports (percentage change 2005-2025)

SECTORS	SCENARIO1	SCENARIO2
PRIMARY	-32.1	71.3
MANUFACTURING	24.4	20.6
SERVICES TRADED	282.7	269.2

Source: Own elaboration based on simulation results

Table 7 compares both Scenarios from a different angle, considering the accumulated effects of trade trends on the wage distribution. The table shows that whereas the projection of current trends (Scenario 1) will produce a widening in the wage gap, an expansion of demands more favourable to the country comparative advantage (Scenario 2) helps to reduce the rate at which the wage rate of unskilled labour deteriorate relative to the other two labour groups. 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 Scenario 2.

Table 7
Effect on wages (percentage change 2005-2025)

WAGES	SCENARIO 1	SCENARIO 2
UNSKILLED	15.0	15.9
MEDIUM SKILLED	17.5	17.7
SKILLED	16.6	16.6

Source: Own elaboration based on simulation results

The analysis at the disaggregated level can provide more insights on the accumulated effects of the Scenarios. In general the variation in effects across sectors is very big, as can be seen in the table in the Appendix, containing the results for the total 43 activities considered. In any Scenario, Transport and travel activities will be the most favourably affected, followed by oil refinery, leather products and financial services, with variations across Scenarios. The sectors adversely affected are mining, metal machinery and equipment, with variations across Scenarios. Table 8 presents the activities with the biggest differences in accumulated effects on output across Scenarios. Here it is shown that Scenario 2 will favour most the activities of crops and related services, forestry and wood, and fertilizers and chemicals for agriculture.

Table 8
Sectors with the greatest differences in effects across scenarios
(percentage change 2005-2025)

ACTIVITIES	SCENARIO 1	SCENARIO 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

IV. 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). The paper investigates the long-term effects of alternative trade patterns on productive sectors and the wage distribution, with a forward looking perspective.

The description of the Uruguayan data on skills and trade reveals 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 heavily semi-skilled labour, it seems that there is a great pressure for intermediate qualified workers. Third, some of the skill-intensive sectors 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 deficiently generated in Uruguay.

The simulation exercises intend to assist in the discussion on long term skill requirements of alternative trade patterns, and the derived effect

on the wage structure, considering the very different mix of qualification employed by sectors. Two alternative scenarios are considered: the current trend in trade growth remains unchanged during the next 20 years; or, the demand for primary products (mainly food) during the next 20 years grows 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 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, so the exercises provide insights on the economy-wide effects in the long term of the interaction of trends in trade and accumulation of skills. In the long term skills supply and demand will affect the wage distribution: while demand with depend on unknown future trade trends, the future supply of skills depend on the current policy of development of human resources. Considering the very different effects on indirect factor demand and returns in different scenarios, the exercise highlights the need of planning ahead the development of human resources, according to likely future scenarios.

Even when the design of optimal policies to alleviate adverse effects of trade shocks is beyond the scope of the paper, it could be said that the policy of development of human resources, difficult to be considered as a "rescue" measure, could perfectly be used as a key element in a long term strategy to prevent the deterioration of the situation of weakest segments of the labour market.

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APPENDIX

ACTIVITIES	SCENARIO 1	SCENARIO 2
CROPS AND RELATED SERVICES	-2	28
LIVESTOCK AND RELATED SERVICES	-20	-20
FORESTRY AND WOOD	-26	9
FISHING AND RELATED ACTIVITIES	-23	-16
MINING	-47	-40
MEAT PRODUCTION AND PROCESSING	-16	-19
PROCESSING OF FISH, FRUITS, VEGETABLES, ETC.	-14	-17
DAIRY PRODUCTS	-9	-11
MILL PRODUCTION	13	11
BAKERY PRODUCTS	-3	-4
SUGAR, COCOA, AND CONFECTIONARY	-9	-13
BEVERAGES	-2	-4
TOBACCO	-1	-3
TEXTILE PRODUCTION	-17	-20
CLOTH AND FUR	-14	-15
LEATHER PRODUCTS	28	25
PRODUCTION OF WOOD AND WOOD PRODUCTS EXCEPT FURNITURE	-25	-28
PAPER PRODUCTS	-5	-7
PRINTING AND EDITING SERVICES	4	3
OIL REFINERY	80	81
FERTILIZERS AND CHEMICAL FOR AGRICULTURE	18	35
PHARMACY	-11	-12
OTHER CHEMICALS	6	4
RUBBER AND PLASTIC PRODUCTS	13	11
OTHER MINERAL PRODUCTS	-1	-2
METALS, MACHINERY, AND EQUIPMENT	-30	-31
VEHICLES AND TRANSPORT EQUIPMENT	24	22
FURNITURE	-11	-13
ELECTRICITY, WATER, GAS	-5	-6
BUILDING SECTOR	26	26
RETAILERS, CAR SERVICING AND SIMILAR	11	12
HOTELS AND RESTAURANTS	9	9
GROUND TRANSPORT	27	26
TELECOMMUNICATIONS AND POSTAL SERVICES	6	5
TRANSPORT AND TRAVEL	183	174
FINANCIAL SERVICES	26	23
REAL STATE	3	2
RENTAL EQUIPMENT, IT, R&D, AND OTHERS	16	14
PUBLIC ADMINISTRATION AND DEFENCE; ADMINISTRATION OF RETIREMENT FUNDS	1	1
TEACHING ACTIVITIES	1	1
HEALTH AND SOCIAL SERVICES	7	7
OTHER COMMUNITY SERVICES	5	5
HOUSEKEEPING	1	1