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Abstract

Empirically, little is known about the effects of trade liberalization on the skill composition of emigration flows in developing countries. The available computational literature has focused, for the most part, on United States-Mexico migration patterns after the creation of the North American Free Trade Agreement. More recent works have investigated the relation between trade liberalization and emigration in Morocco, without looking to the impact of trade liberalization on skilled and unskilled migration. This paper investigates the effects of trade liberalization on the skill composition of migrant flows in Morocco. Because trade agreements involve substantial changes in prices, resource allocation and income, they also affect migration incentives, when migration is motivated by the wage differential between receiving and sending countries. Trade liberalization will be problematic for an unskilled-labor abundant country like Morocco, if it gives incentives to skilled workers to move across borders. An appealing way of addressing this topic is to formulate a dynamic computable general equilibrium model that illustrates the transmission channels by which trade liberalization affects local wages and migration incentives. The model is calibrated on the Moroccan Social Accounting Matrix (SAM) of 2003. The results show that both the free trade agreement with the European Union and multilateral liberalization reduce skilled and unskilled migration flows, but is more pronounced in the multilateral case.

ملخص

تجريبيا، لا يعرف إلا القليل عن آثار تحرير التجارة على تكوين المهارات لتدفقات الهجرة في البلدان النامية. وقد ركزت الكتابات المتاحة الحسابية، في معظمها، على أنماط الهجرة الولايات المتحدة والمكسيك بعد إنشاء اتفاق أمريكا الشمالية للتجارة الحرة. حققت أعمال أكثر حداثة العلاقة بين تحرير التجارة والهجرة في المغرب ، دون النظر إلى أثر تحرير التجارة على هجرة العمالة الماهرة وغير الماهرة. هذه الورقة تحقق من آثار تحرير التجارة على تكوين المهارات لتدفقات المهاجرين في المغرب. لأن اتفاقات التجارة تنطوي على تغييرات كبيرة في الأسعار ، وتخصيص الموارد والدخل ، وأنها تؤثر أيضا حوافز للهجرة، عندما يتم دوافع الهجرة، والفرق في الأجور بين البلدان المرسلة والمستقبلة. وسوف تكون مشكلة تحرير التجارة بالنسبة لغير المهرة في بلد وفيرة اليد العاملة مثل المغرب، خاصة اذا كانت تعطي حوافز للعمال المهرة على التحرك عبر الحدود. هناك وسيلة جذابة لمعالجة هذا الموضوع الحيوي وهى صياغة نموذج محسوب للتوازن العام والذي يوضح قنوات الانتقال والتى تؤثر من خلالها تحرير التجارة على الاجور والحوافز المحلية للهجرة. يتم معايرة النموذج المغربي على مصفوفة المحاسبة الاجتماعية (SAM) من عام 2003. وأظهرت النتائج أن كلا من اتفاق التجارة الحرة مع الاتحاد الأوروبي وتحرير التجارة المتعدد الأطراف خفض من تدفقات الهجرة الماهرة وغير الماهرة، ولكنه أكثر وضوحا في الحالة المتعددة الأطراف.

1.Introduction

With increased openness of developing countries and efforts to adjust their trade policies to match the World Trade Organisation rules, the major concern stems from the potential labor market effects of integration and enlargement. A sketchy analysis suggests that trade liberalization should expand the less protected sectors and contract the highly protected ones. If the expanding sectors are labor-intensive, trade liberalization may dampen unemployment rates and/or increase wages. If migration is driven by the wage differential between receiving and sending countries, then trade liberalization may reduce migration incentives. This issue is of prime importance at a time when industrialized countries have closed their doors to Southern workers for economic, social and security reasons. Another issue concerns the effect of trade liberalization on the skill composition of migrant flows. Indeed, developing countries are unskilled labor-abundant. Any trade agreement that decreases the wage of skilled workers would lead to a "brain drain".

This paper explores the link between trade liberalization and the skill composition of migrant flows in Morocco. The country is in the crux of the trade liberalization process. It is about to achieve a free trade area (FTA) with the European Union (EU) by 2012 and has signed free trade agreements with the United States (US), Turkey and other Arab countries. Another concern is whether, and to what extent it should pursue additional trade liberalization: does the FTA with the EU promote enough growth and employment in Morocco so that migration incentives decrease or should the country carry on additional efforts for multilateral liberalization? Because trade agreements involve substantial changes in prices, resource allocation and income, and affect capital stock through savings as well as human capital and technology, the analysis is done with a dynamic CGE model for the Moroccan economy.

The relation between trade and migration has extensively been analyzed on both theoretical and empirical grounds. Factor mobility is a substitute for trade if trade liberalization allows factor price equalization. Mundell (1957) showed that trade and migration are substitutes in the standard Heckscher-Ohlin (HO) model of trade with two production factors under the usual assumptions. However, the Mundell model and related evidence have been questioned both at the theoretical and empirical levels. In their literature review, Faini et al. (1999) clearly explain how the conclusions of Mundell can be reversed simply by using more realistic assumptions[1].

Empirically, little is known about the effects of trade liberalization on emigration flows in developing countries. The available computational literature has focused, for the most part, on US-Mexico migration patterns after the creation of the North American Free Trade Agreement. Hill and Mendez (1984) show that a removal of trade barriers reduces migration flows from Mexico to the US, but that the reduction is fairly modest. By contrast, Robinson et al. (1993) argue that trade liberalization in agriculture greatly increases rural-urban migration within Mexico and migration from Mexico to the US, and that lower migration is

[1]For example, when the difference in technology is allowed in a Ricardian framework and if the rich country is more productive in the labor-intensive sector, it will export the labor-intensive good, and then display a higher wage. If labor mobility is now allowed, labor will migrate from the poor country to the rich one, and, through standard Rybczynski effects, this will strengthen the specialization of the rich country in the labor-intensive sector. Specific-factors models can also induce a relation between trade liberalization and migration that is different from the standard HO model. Trade liberalization reduces the price of the importable good and then depresses the demand for labor (the mobile factor) in the import sector. Both the nominal wage and the real wage in terms of the exportable good fall. However, the real wage in terms of the importable good will increase and this will be translated to the whole wage only if the weight of importable goods in the consumption budget is high. Without being exhaustive, a final example concerns financial-constraints models. Lopez and Schiff (1998) show that, when migrants are financially constrained and unable to migrate due to migration costs, and if trade liberalization raises the wage in the labor-abundant sending country according to the HO model, financial constraints will be relaxed and, paradoxically, migration will increase.

only possible if Mexico grows relative to the US and if it retains farm support programs. Melchor del Rio and Thorwarth (2006) give support to Robinson et al. (1993) by showing, using monthly data from 1966 to 2004, that greater trade flows cause larger illegal migration from Mexico to the US. More recent works were interested in the relation between trade liberalization and emigration in Morocco. The CGE analyses of Bouzahzah et al. (2007) and Cogneau and Tapinos (1995), based respectively on 1985 and 1980[2] data, both conclude that trade liberalization did not help reduce migration flows. By contrast, Faini and de Melo (1995) develop a macro-econometric model calibrated for the year 1988 and show that trade liberalization induces a real exchange rate depreciation that, on the one hand, results in higher production costs and lower supply, and on the other hand, boosts labor intensive exports and labor demand. The second effect dominates so that trade liberalization is found to promote employment and thus discourage migration.

However, none of the previous works investigated the impact of trade liberalization on skilled and unskilled migration. In the standard HO model, and given that Morocco is unskilled labor-abundant[3], it must export unskilled labor intensive goods and import skilled labor intensive ones. In order to meet increasing exports, labor demand of unskilled workers must rise and unskilled wage must adjust upward to balance the labor market. In this context, trade liberalization would be a substitute for unskilled emigration. By contrast, if Moroccan imports are skilled labor intensive and when imports replace domestic production, skilled labor demand decreases and so does the wage of skilled workers. Consequently, skilled workers choose to leave. In this context, skilled migration and trade liberalization would be complements. Given that Morocco's main trading partners are developed skilled labor-abundant countries and since Moroccan imports mainly consist of capital and technology goods, it is true to think that they are skilled labor intensive. Therefore, one would expect unskilled migration to decrease and skilled migration to increase, following tariff removal.

This paper looks at the labor market effects of Moroccan trade liberalization with a special look to its impact on the skill composition of migrant flows. Limiting the comparison to the works using the same methodology, the paper suggests a model more adapted to migration and trade liberalization issues. International and internal migration are motivated by observed wage differentials and the effect of urban unemployment rate on migration incentives is taken into consideration. A sequential dynamic module is added making possible the allocation of savings, including remittances, to investment. Therefore, the evolution of migration flows also affects capital accumulation through skilled and unskilled migrants' abilities to remit. The model is calibrated on a disaggregated SAM of 2003, thus offering an updated analysis of this subject, in contrast to the previous works.

Two trade liberalization scenarios are considered, the first consisting of the Morocco-EU FTA and the second of multilateral liberalization. The results show that trade liberalization is a substitute for migration, contrary to Bouzahzah et al. (2007) and Cogneau and Tapinos (1995). This substitutability prevails for both skilled and unskilled individuals.

The paper is organized as follows: Section 2 provides a brief background of the Moroccan economy, with a focus on trade policy and migration flows. Section 3 depicts the theoretical framework. Section 4 discusses the results of the simulation experiments and Section 5 concludes.

[2]Nevertheless, the SAM of Cogneau and Tapinos (1995) was updated by data on external trade and taxation in 1990.

[3]Skilled workers (with tertiary education) only account for 20% of Moroccan working population (Royaume du Maroc, 2003).

2.Background

Table 1 summarizes the structure of Moroccan foreign trade in 2003, with a particular description of the relations with the EU. Morocco's comparative advantage resides in the following sectors: wearing apparel, phosphates and derivatives, Mediterranean agricultural products. Industrial products constitute more than half of Moroccan exports. They mainly concern light industries such as wearing apparel and electronics. Agricultural products, including fruits, vegetables and seafood (fresh or canned) are also important, representing about 25% of exports. Comparative disadvantages are concentrated in capital goods, consumption goods of large and medium value-added, intermediary products, food and oil products.

Since 1993, Morocco has dramatically liberalized its foreign trade. By 1993, the maximum rate for customs duties had been lowered to 45% and, most impressively, no imports required a license (other than for health and safety reasons). On the export side only minor restraints remain. Therefore, a trade regime free of non-tariff barriers is taken as a departure point. Tariff rates by sector for 2003 are presented in column 5 of Table 1. High tariffs are applied on products that closely enter in competition with Moroccan products such as agriculture, food, tobacco, wood products, rubber and plastics, cars and other industries. The lowest tariffs are applied on intermediary products, capital goods and high value added consumption products that are not produced in Morocco such as machines and equipment, office machinery, electrical machines, radio and TV, medical instruments, mining, chemicals, oil refining, other transport means.

The EU(27) is Morocco's major trading partner, representing 60% of Moroccan imports and 75% of exports in 2003 (Ministry of Foreign Trade, Rabat). In 1996, Morocco signed an association agreement with the EU to establish a free trade area between the two partners over a transitional period lasting a maximum of twelve years.

The agreement entered into force in March 2000 and the free trade area has to be executed by 2012. For industrial imports from EU, Morocco is committed to a gradual elimination of tariff rates, and the abolishment of any quantitative restrictions, taxes, and other measures that have the same effect as tariffs. In return, Morocco will receive aid for education and infrastructure projects over a period of five years (Caupin 2005) and with few exceptions, Morocco's non-agricultural exports will continue to enjoy unrestrained access to the EU. As expected, the last column of Table 1 shows zero tariff rates on most industrial products, mainly intermediary products, capital goods and high value-added consumption goods. Tariff rates remain particularly high on agriculture, food and tobacco products, wood products, rubber and plastics, non-metallic minerals and car industry. The average tariff on agriculture is slightly higher than the rate applied on agricultural imports from the rest of the world (RoW). This can be explained by the fact that the RoW contains all non-EU countries, including Arab ones, who signed several agreements with Morocco (such as the Agadir agreement and the Arab FTA).

The potential labor market effects of lower tariffs depend on the labor intensity of the most and the least protected sectors. If the most protected sectors are labor intensive, trade liberalization may increase unemployment rates and/or decrease wages, that in turn affect migration incentives. Migration flows in the base year are borrowed from OECD (2006). Moroccan emigration is approximated by the flows of Moroccan migrants to their traditional destinations, such as Belgium, France, Italy, the Netherlands and Spain. In 2003, these countries received 102,000 Moroccan migrants. In addition, these migrants mostly originated from rural areas (Erf and Heering 2002). Calculations from Hamdouch (2005) show that approximately 31% of total migrant flow are skilled.

3.Model Structure

In order to address the topic, some crucial features need to be incorporated in the model. First of all, because trade liberalization is able to influence migration incentives through its labor market effects, migratory flows must be endogenized to depend on wage differentials between receiving and sending countries. Secondly, since the tariff rate on agricultural products is the highest, and given that agriculture employs more than 80% of rural workers, any liberalization scenario affecting agriculture has its most direct effects on the rural labor market, and indirectly via internal migration, on the urban labor market[4]. Internal migration needs then to be incorporated in the model. Thirdly, urban unemployment, accounting for 18.3% of the working population in 2003, is the principal cause for emigration in Morocco (Hamdouch 2000). It should then be taken into consideration in the analysis especially when massive internal migration may exert upward pressures on unemployment in urban areas, despite urban emigration to foreign countries (Karam and Decaluwé 2010). Lastly, the time dimension is also an important feature in order to describe adjustment periods, and the corresponding dynamic effects of trade liberalization.

The present model is a real, small, open economy, one that draws on existing economy-wide models of Morocco (Agénor and El Aynaoui 2003; Karam 2010; Karam and Decaluwé 2010; Löfgren et al. 1999; Rutherford et al. 1997). The model parameters are calibrated on a disaggregated SAM for 2003 provided by Touhami Abdelkhalek. The disaggregated version of the SAM gathers three production factors: rural and urban labor as well as capital; 39 multi-productive sectors distributed between rural and urban areas; five agents (rural and urban households, firms, the government, and RoW). The model is implemented in GAMS (Brooke et al. 1988) and solved with NLP, a non-linear programming solver. The following presentation uses a minimum of mathematical formulations.

3.1 Migration flows

The model allows international migration from rural and urban areas as well as internal migration from rural to urban areas. Migration flows are determined by observed real wage differentials between the region of destination and the region of origin, net of migration costs. Migration costs are a fraction of migration flows, following Chan et al. (2005). Urban unemployment is also able to affect the determinants of internal migration from rural to urban areas, as well as the determinants of international migration from urban areas. Following Karam and Decaluwé (2010), migration from rural areas is modeled as a two-stage decision process: the rural worker first maximizes his expected income considering the choice of staying in Morocco or leaving the country. Then, the rural worker who has decided to stay in Morocco carries out the choice of staying in rural areas or migrating to the cities. Similarly, the urban worker maximizes his expected income by choosing to stay in Morocco or migrate abroad. Migration decisions are summarized in Figure 1.

Note that only urban population is composed of skilled and unskilled workers and then any possible migration of skilled workers only occurs from urban areas. This assumption is not contestable as unskilled labor accounted for 90% of rural working population in 2003 (Royaume du Maroc 2003). As it is highlighted in the "brain drain" literature, skilled workers contribute to innovation, technological adaptation and adoption, and are able to raise productivity through mutual interaction. The negative externality of skilled migration on skilled labor supply is represented by the following equation: $A_{2up,t} = A_{2up,t-1} \frac{NATU_{``sk",t}}{NATU_{``sk",t-1}}^{ske}$,

where

[4]According to Agénor and El Aynaoui (2003), approximately 200,000 internal migrants move annually into urban areas, which is equivalent to 40% of the total increase in urban population.

$A_{2up,t}$	is the total productivity of the composite factor (capital and skilled labor (see below)) at period t,
$NATU_{``sk",t}$	urban skilled labor supply at period t,
ske	the positive externality parameter of skilled workers[5].

3.2 Production activities

The production function is described in Figure 2. Perfect complementarity is assumed between value added and intermediate consumption. Intermediate consumption aggregate is, in turn, a Leontief function of sectoral inputs, imported or locally produced. Value added is a constant elasticity of substitution (CES) function of unskilled labor and a composite factor, that is, in turn, a CES bundle of capital and skilled labor. This structure is intended to take into account the well documented skill-capital relative complementarity. Following the MIRAGE model (Bchir et al. 2002), the elasticity of substitution between capital and skilled labor is set to 0.6 while the elasticity between this bundle and unskilled labor is set to 1.1.

The model is distinguished by an explicit separation of activities and households into rural and urban. Rural sectors consist of agriculture and fishing. The non-agricultural and non-fishing sectors of the economy are urban. Rural activities only use unskilled labor. Rural value added is thus a CES combination of unskilled labor and capital. In urban areas, the labor force of each activity includes both skilled and unskilled labor and urban value added has the form described in Figure 2.

Production functions in agriculture and services display constant returns to scale. By contrast, industrial sectors are modeled according to an oligopolistic competition framework with increasing returns to scale, in line with other works on Morocco (Bouzahzah et al. 2007). Every industry consists of N identical firms, each producing a single commodity that is a close substitute for the products of its domestic competitors. The marginal production cost is constant at given factor prices, and production involves each year a fixed cost, expressed as a fixed quantity of capital. The scale economies referred to in this paper are at the level of the individual plant in the manufacturing sector and hence internal to the firm. Thus, average cost exceeds marginal cost, so that perfectly competitive, marginal cost pricing would result in losses. In other words, firms enjoy some market power, enabling them to price over marginal cost[6]. In the short run, the number of firms is held constant and profits may vary. In the long run, the free entry-exit of firms brings profits back to their benchmark value[7].

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[5]The externality parameter is fixed to 0.1, a fair low value. The results of the sensitivity analysis (available to the interested reader upon request) show that GDP growth is hardly affected by reasonable values for this parameter.

[6]Introducing imperfect competition with increasing returns to scale raises problems when a single activity produces many commodities. Indeed, as far as imperfect competition is concerned, it relates to commodities not activities. Increasing returns to scale however relate to activities. If a single activity produces two commodities, one in a perfect competition structure and the other with an imperfect competition structure, different pricing rules should be adopted for the two commodities. This also means that different technologies should be used inside a single activity. However, this raises the problem of factor intensity to be used for calibration of labor and capital by technology at the base year. For lack of data, it is supposed here that the commodity is produced in an imperfect market structure, independent of the activity that produces it, but fixed costs required for production are only financed by the activity that mainly produces this commodity (with at least 80% of production devoted to that commodity). In exchange, the latter earns all the profits coming from market power.

[7]The common case would be to consider a long run equilibrium in the base year (with zero benchmark profits) and suppose that the free entry-exit of firms generated by the model brings back profits to zero. In this model,

3.3 Institutions

Rural and urban households receive the bulk of their incomes from labor remuneration in their respective regions. Urban household's labor income is composed of both skilled and unskilled labor remunerations. In addition to labor income, households receive capital remuneration, migrant remittances and constant transfers from the government and the other agents. Total household income is used to pay direct taxes and fixed amounts of transfers to other agents, to save and consume. Direct tax rates are fixed shares of households' income. Savings are fixed shares of households' disposable income. Consumption demand is determined by a linear expenditure system. In addition to capital remuneration, government income consists of direct taxes, production and sales taxes as well as import and export tariffs (with different rates applying to EU and non-EU products). All taxes are *ad-valorem*. Besides transfers to the other agents, the government uses its income to buy a fixed quantity of consumption goods. Firms' income is composed of capital remuneration and fixed transfers. The RoW receives import sales and fixed transfers, and pays the FOB value of exports in addition to remittances and fixed transfers.

3.4 System constraints

3.4.1 Commodity markets

Figure 3 summarizes the commodity flows underlying the market for a given product that is produced by two activities and is traded in both directions, with EU and non-EU countries. Tradable sectors sell their production on domestic and international markets, according to a constant elasticity of transformation (CET) function. As well, exports to EU vs. non-EU countries are imperfectly transformable. Exports of domestic firms face the economic constraints of international markets materialized by a finite export elasticity.

Domestic demand for goods and services is satisfied by local production and imports. These are supposed to be imperfect substitutes for local products, following the Armington assumption (Armington 1969). Imperfect substitutability is also assumed for imports from different regions (here EU and non-EU countries).

Each type of consumption is a vertical combination of goods and services and a horizontal combination of local and imported products. The horizontal structure of each composite product is supposed to be identical for final consumption by households and the government, intermediary consumption, investment demand by firms and stock variation.

3.4.2 Factor markets

Installed capital is sector-specific, so that the rental rate of capital varies across sectors. Therefore, and given that other things are equal, capital will be invested in sectors where it is highly remunerated. Rural labor is unskilled and perfectly mobile between rural sectors. It is assumed to be fully employed: a market-clearing price generates demand-supply balance. Skilled and unskilled urban workers are mobile between urban sectors but urban labor markets are imperfect due to the existence of unemployment. In this case, the unemployment rate is the clearing variable. The wage curve (Blanchflower and Oswald 1995) insures a negative relation between urban real wage and unemployment rate.

3.4.3 Macroeconomic constraints

The macroeconomic closure adopted here is the one found in the literature on Morocco. This closure fits Moroccan reforms after the structural adjustment period: government savings are

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profits are supposed to be equal to 10% of the base year capital remuneration by sector and the free entry-exit of firms brings profits back to their benchmark value. Indeed, Morocco, like other developing countries, is subject to barriers to firm entry. Therefore, profits can hardly be brought back to zero. However, the sensitivity analysis shows that the change of GDP, when profits are brought back to zero, is close to the results reported here.

a fixed share of GDP. Uniform adjustments in the rate of sales tax insure that the government savings target is met. Foreign savings are fixed. A flexible real exchange rate clears the balance of the RoW. For each household, savings are a fixed share of his disposable income. Firms' savings are also determined by the model. Hence, none of savings sources is free to equilibrate the aggregate savings-investment balance: the model has a savings-driven determination of investment.

3.4.4 The dynamic module

The model is a recursive dynamic one where agents have myopic behavior. Between the static-model solutions, selected first-period exogenous variables are updated between periods, either by using lagged endogenous variables or exogenous trends. Capital stock is updated endogenously on the basis of previous investment and depreciation.

Rural and urban populations are updated between periods according to an exogenous natural population growth rate as well as migration flows. More specifically, rural population LSR_t grows at the exogenous population growth rate g_{LSR}, net of migration to urban areas MIG_t and of international migration from rural areas EMR_t.

$$LSR_{t+1} = LSR_t(1+g_{LSR}) - MIG_t - EMR_t$$

Following Agénor et al. (2003), I make the assumption that urban individuals are born unskilled, so that urban unskilled population grows according to the natural urban population growth rate g_{LSU} and migration of unskilled labor from rural areas. Moreover, at each period, an exogenous fraction of urban unskilled workers ska acquires skills and leaves the unskilled labor force to increase the supply of skilled labor[8]. Finally, there are international migration flows of skilled and unskilled urban workers $EMU_{qu,t}$. Thus, the evolution of urban unskilled and skilled population is given respectively by:

$$LSU_{``un",t+1} = LSU_{``un",t}(1+g_{LSU}) - skaLSU_{``sk",t} + MIG_t - EMU_{``un",t}$$

$$LSU_{``sk",t+1} = LSU_{``sk",t}(1+ska) - EMU_{``sk",t}$$

Following Karam (2010), I also distinguish between different migrant generations having different remitting behaviors. The first generation of migrants still has strong ties with the family left behind and remits more. The second generation that later brought spouses and children in the process of family reunification has lost some of its attachment to the country of origin, but still remits (lower amounts than the first generation) in order to support the parents left behind. The third generation of migrants is supposed to be highly integrated in the country of destination and barely remits. The first generation of migrants receives, at each period, current flows. Also, a fraction of the first generation loses, at each period, some of its attachment to the home country and joins the second generation. As well, a fraction of the second generation becomes more disconnected from the family left behind and joins the third generation.

The evolution of migration stocks also affects capital accumulation through skilled and unskilled migrants' abilities to remit. In Morocco, remittances are motivated by altruism. They decrease with households' real wage and increase with migrant wage. Unskilled and skilled migrants have different remitting behaviors (Faini 2007): the elasticity of skilled

[8] In other words, I do not take into account the induced effect of skilled migration on the education of those left behind. Indeed, it is true to think that migration prospects may foster investment in education because of higher return to education abroad. However, estimates about the elasticity of induced education with respect to skilled migration are not available for Morocco.

remittances with respect to households' real income is lower than unskilled labor elasticity[9], because skilled migrants spend more time and reunite with their family in the host country. Conversely, since skilled migrants earn more, they are expected to remit more. This is reflected by a higher international skilled wage[10]. Remittances enter households' income and are allocated to investment through households' savings.

4.Simulation Experiments

The paper explores the impact of two scenarios for trade liberalization on migration incentives. The first simulation FTA defines the commitment made with the EU to gradually implement a free trade area by 2012[11]. The second simulation MULTI assumes that Morocco gradually liberalizes its external trade with all partners, including EU countries[12]. Before analyzing the results of the liberalization scenarios, let me describe briefly how the economy reacts to the updating mechanisms, between periods, of the first-period exogenous variables, what is referred to as "Business as Usual" (BAU, Table 2, Appendix B).

4.1 The BAU growth path

Increased consumption by the growing urban population drives upward the demand of goods and services. Given that other things are equal, prices rise and motivate firms to produce more. Higher production is translated into higher economic growth (around 3.5%).

In spite of population growth, the rising demand for production factors necessary to achieve sectoral expansion, is high enough to increase the wage in rural areas, and reduce skilled and unskilled unemployment in urban areas. The wage curve then insures that skilled and unskilled real wages rise in urban areas. Given that other things are equal, the real wage increase explains the improvement of rural and urban households' real disposable income. The higher labor demand also increases, *ceteris paribus,* the marginal productivity of capital as well as capital remuneration.

Since internal demand is composed of domestically produced and imported products, higher demand is translated into higher imports. The macroeconomic closure that maintains external savings fixed induces, *ceteris paribus*, a depreciation of the real exchange rate[13] in order to boost exports. In terms of GDP deflator that stands here for the *numéraire*, the nominal[14] exchange rate also depreciates.

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[9]The elasticity is equal to -4.2 for unskilled migrants, following Bouhga-Hagbe (2004), and to -2.2 for skilled ones.

[10]Skilled wage premium for migrants is calculated on the basis of a weighted average of skilled wage premium in the main OECD countries receiving Moroccans. This results in a wage of 1.5 times higher for skilled migrants with respect to unskilled ones. Following Bouhga-Hagbe (2004), the elasticity of skilled and unskilled workers with respect to their international wage is set to 1.8. This elasticity is not supposed to alter the results because the international wage is kept constant in all scenarios.

[11] Trade liberalization with the EU does not exactly obey the FTA agenda by product because the commodity classification in the agreement does not match the sectoral classification of the SAM. Instead, tariffs are gradually removed until free trade takes place in 2012. It should be also pointed out that the analysis focuses on a reduction of protection in Morocco. In other words, imports tariffs are unilaterally removed in Morocco. Tariff removal means free access to the Moroccan market of industrial and agricultural products originated from EU(27).

[12]Multilateral liberalization of Moroccan imports in agriculture and industry also occurs gradually until 2012. Complete liberalization in agriculture is a strong assumption as agriculture is a sensitive topic in trade negotiations between developing and developed countries, especially Europe. However, it is adopted here like in Bouzahzah et al. (2007) and Cogneau and Tapinos (1995) to make the results comparable with their works.

[13]The price of a unit of foreign currency in domestic currency.

[14]Let me recall that this is a real model. All variables are expressed in terms of GDP deflator that stands for the *numéraire*. I only use the term nominal exchange rate for convenience to outline the conversion unit of the

The exchange rate depreciation raises the value of the foreign wage in domestic currency and hence motivates rural and urban emigration, despite higher real wages. However, after period 5, the real wage increase compensates the exchange rate depreciation and dampens migration incentives for rural and urban workers. In rural areas, unskilled wage strongly rises, due to the expansion of the agricultural sector that constitutes a big part of households' consumption budget, leading to a reduction of internal migration flows.

Two factors determine the evolution of remittances: migration flows and the altruistic motive. Households' real disposable income increases over periods. Therefore, according to the altruistic motive, remittances by rural and urban migrants must decrease. The results show that the evolution of migration flows dominates the altruistic effect until period 5. The lower amount of remittances received by the economy after period 5 as well as terms of trade deterioration due to the real exchange rate depreciation both explain why GNP increases less than GDP.

Recall that remittances affect capital accumulation through households' savings. Despite lower remittances, households' income increases due to higher factor remuneration. Therefore, households' savings increase too. It is also the case of firms and government's savings. In sum, the investment capacity of the economy grows.

After the shock, the economy will have another growth path due to the simultaneous effect of the shock and the updating mechanisms of the first-period exogenous variables. Consequently, the analysis should be done with respect to the BAU growth path[15].

4.2 FTA: The Morocco-EU Free Trade Area

The gradual implementation of the FTA makes Moroccan imports from the EU cheaper than domestic products and imports from the RoW, encouraging then the consumption of European products. Since the macroeconomic closure considers external savings fixed, the higher import volume should be compensated, *ceteris paribus*, by higher exports. This is made possible by a depreciation of the real exchange rate.

According to the standard HO model, trade liberalization should boost exports of unskilled labor-intensive products, those where Morocco has a comparative advantage. By contrast, imports must increase in skilled labor-intensive disadvantaged sectors and, given that other things are equal, depress local production. It is indeed the case of capital and technology goods such as machines and medical instruments. Nevertheless, the results also show a contraction of some unskilled-labor intensive sectors: agriculture, tobacco, rubber and plastic industry, non-metallic minerals, metallurgy, metal processing, furniture and other industries. According to Table 1, those sectors are the most protected and thus experience the greatest competition from European products. However, the negative demand effect in food and car industries is more than compensated by the pro-competitive effect of trade liberalization. In the expanding sectors, production growth is made possible by increased exports to foreign countries stimulated by the depreciation of the real exchange rate and cheaper intermediary inputs. The expansion of these activities offsets the negative effect of the contracted sectors on GDP so that the overall economic activity grows over the five first periods. Despite GDP growth, the GNP decreases due to terms of trade deterioration following the real exchange rate depreciation.

Labor demand of skilled and unskilled workers evolves according to the skill intensity of the contracted and expanded sectors. If the contracted ones are skilled labor-intensive in which

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international wage in domestic currency. However, since the real exchange rate (in terms of the *numéraire*) depreciates, it is also true to say that the nominal exchange rate or the conversion unit rises.

[15]For the sake of brevity, only some of the results are displayed in Appendix B. A detailed version of the paper can be provided to the interested reader upon request.

Morocco is disadvantaged, skilled labor demand will decrease and so will the skilled wage. Skilled workers will then be motivated to leave the country. On the other hand, the demand for unskilled labor used intensively in the expanded sectors will increase and so will the unskilled wage. Consequently, unskilled workers will choose to stay at home. This is what the comparative advantage theory predicts. However, as pointed out earlier, the results also depend on the initial tariff structure. For example, agriculture is highly protected and still unskilled labor-intensive. Consequently, when this sector contracts following tariff removal, the decreasing unskilled labor demand could compensate the increasing unskilled labor demand from the expanded sectors and induce a drop in unskilled wage, with what follows in terms of higher migration incentives. Symmetrically, if the initial tariff on skilled-labor intensive sectors was close to zero in the base year, as it is the case for example in office machinery and financial services, the FTA creation will not necessarily induce a contraction of those sectors, nor a lower skilled labor demand. Then, if other things are equal, skilled wage needs not to decrease and skilled workers to leave. In other words, the initial tariff structure could reverse the results. Does the comparative advantage theory or the initial tariff structure effect dominate?

Agricultural products, initially highly protected, are not able to compete with European goods, once tariffs are removed. Imports replace domestic production, leading to a contraction of the agricultural sector. Consequently, unskilled labor demand decreases in rural areas and, given that other things are equal, rural unskilled wage falls in order to balance the market. While the initial protection effect dominates in rural areas, the results show a little bit of both effects in urban areas. Labor demand for unskilled workers increases, following the prediction of the comparative advantage theory. Unskilled unemployment then falls and the wage curve insures that urban unskilled real wage increases. According to the same theory, one would expect a contraction of the skilled labor-intensive sectors, in which the Moroccan economy is disadvantaged. However, this does not occur because those sectors are initially less protected. Instead, they expand because the real exchange rate depreciation and lower input prices motivates exports. The CES value added then insures that expanding urban sectors raise the demand for the composite factor. Given the relative complementarity between capital and skilled labor, the increasing demand for the composite factor induces a rise of skilled labor demand. This is able to reduce skilled unemployment and raise the skilled real wage[16]. Household real disposable income follows the evolution of rural and urban real wages.

Here, it is brought to attention how real wages affect migration flows. In rural areas, the deterioration of rural real wage motivates people to leave. While urban migration flows are expected to decrease following the real wage improvement, the results show higher migration incentives because of the exchange rate depreciation that raises the value of the international wage in domestic currency. Note that GDP grows more in the short run simulation: indeed, a single firm that faces the same negative demand effect in the short and the long run simulations, can choose to leave the market in the long run. By contrast, in the short run, it produces even if profits are negative. That is why wages increase more in the short run model and compensate the positive effect of the exchange rate depreciation on migration flows. Furthermore, if one looks at the composition of migrant flows, it is possible to notice that the proportion of unskilled migrants increases with respect to skilled ones. This result is contradictory to the HO theory.

Remittances are motivated by altruism, they depend on households' real disposable income. As expected, rural migrants remit more and urban migrants remit less. In sum, the total

[16]In this simulation, nominal wages follow the evolution of real wages (in terms of rural/urban consumer price index).

amount of remittances increases but does not compensate the negative effect of the terms of trade deterioration on GNP. The evolution of remittances is also important because they affect capital accumulation through their impact on household savings. Indeed, the overall value of savings increases, allowing a greater investment capacity. It should be pointed out here that public savings increase, in spite of lower import tariffs. This is particularly coming from the savings-driven macroeconomic closure: in order to maintain fixed the share of public savings in nominal GDP, the rate of sales tax should adjust upward to compensate the loss of import tariffs.

At the beginning of period 8, as far as tariffs are decreased, the above-mentioned contracting sectors shrink more and compensate the positive effect of expanding sectors on GDP growth. The economic contraction is such that labor demand of skilled and unskilled workers decreases after period 10. Unemployment then rises and the wage curve insures that urban real wages fall. This causes urban household income to decrease. All along the periods, household welfare[17] follows the evolution of households' real disposable income. That is why rural and urban household welfare finally decrease by about 0.5% of their consumption budget. It becomes clear now why migration flows are further motivated. Since GDP grows more or decreases less in the short run simulation, economic contraction occurs later in the short run model and wages start decreasing at period 15. But this does not increase migration flows at period 15 because those depend on observed, not actual, wages. Finally, it is worth mentioning that, starting period 10, rural wage increases in the short-run model, and decreases less than before in the long-run model: primarily because the fishing sector expansion compensates the contraction of agriculture, then because labor supply decreases in rural areas due to higher migration flows. Surprisingly, rural emigration decreases starting period 10, despite the negative change of real rural wage in the long run simulation. This is explained by the fact that rural migration is affected by the observed national unskilled wage, because the rural worker makes a choice of migrating to urban areas or to foreign countries. It happens that the national unskilled wage is driven up by the urban unskilled wage. At present, the composition of migrants is skilled-biased.

Bouzahzah et al. (2007)[18] found that the FTA agreement induces a drop of the wage rate, that in turn stimulates migration. In this paper, the results show that the real wage only decreases in rural areas. By contrast, the purchasing power of urban workers improves and it is the exchange rate depreciation, that motivates emigration. Migration is generally due to a pull factor and not to a push factor, as it is the case in Bouzahzah et al. (2007). Furthermore, in the short run model, both rural and urban migration decrease.

There are also many differences found between the results of Bouzahzah et al. (2007) and mine at the sectoral level: in Bouzahzah et al. (2007), the agricultural sector expands while industry and services shrink. Exports sharply decrease and, besides higher imports, weaken the current account. In this paper, the results show a depression of the agricultural sector and an expansion of many industrial and service sectors where Morocco is advantaged, or that were not highly protected in the base year. One possible explanation of this difference between the two papers is that the authors use an aggregated SAM of 1985, while the FTA trade agreement entered into force in march 2000. First, sectoral aggregation hides the diversity of protection applied to the disaggregated sectors and then affects losers and winners from liberalization. Secondly, in 1985, tariff and non-tariff barriers were still high and Morocco was in the midst of structural adjustment. Thirdly, the international market shares of Moroccan main exports changed in 15 years. The part of Moroccan exports in international export value passed from 0.27 to 0.35% for food industry, from 0.34 to 0.66%

[17] Welfare is given by the equivalent variation of household's consumption budget.

[18] The authors use a static CGE model with an imperfect competition structure in commodity markets.

for textile and leather, from 0.47 to 0.19% for chemicals. But the big change concerned the Moroccan export shares in European markets (from 0.22% to 0.25%): the Moroccan market share raised from 0.46% to 0.53% in the food sector and from 0.68% to 1.74% in textile and leather industry, while the part of chemicals fell from 0.58% to 0.16% (Moroccan Ministry of Finance and Privatization 2005). Another explanation is that Bouzahzah et al. (2007) did not take into account the dynamic effects of trade liberalization and the possibility of different behaviors for skilled and unskilled labor.

4.3 MULTI: Multilateral liberalization

This shock consists of a gradual tariff removal affecting all Moroccan imports, including those originating from non-European countries. If Morocco has the same trade characteristics with the EU and the RoW, then the transmission channels of this shock must be the same as before but with greater magnitude, because now all import tariffs are removed. As expected, multilateral liberalization boosts imports from the EU and the RoW, in comparison to the FTA case. Surprisingly, imports of the following European products fall: fishing, mining, tobacco, textile, clothing, leather, wood, paper, chemistry, metallurgy, machines and equipment, office machinery, electrical machines, radio and TV, medical instruments, car industry, manufacture of other transport means, furniture and other industries. This is mainly explained by increased competition of South-East Asia and Arab countries. The macroeconomic closure that considers external savings fixed imposes that additional exports should compensate, *ceteris paribus*, the higher import volume. This means that the real exchange rate should depreciate more than the FTA case.

Highly protected sectors shrink more, because now import tariffs are also lowered on imports from the RoW. The remaining sectors profit from the stronger real exchange rate depreciation and cheaper inputs in order to channel their production to foreign markets. In comparison with the FTA, the higher export growth induces a greater expansion of the overall economic activity. GDP growth is higher than the gradual FTA case and the GNP decreases more due to greater terms of trade deterioration. However, after period 5, the sharper the competition becomes, the more non-competitive sectors reduce their prices, and the more they prefer to sell on foreign markets. Export expansion is high enough to compensate the previous depreciation of the real exchange rate, partly or completely. The low depreciation or sometimes the appreciation of the real exchange rate explains the positive evolution of GNP after period 5.

The higher expansion of the low protected urban sectors is translated in a greater demand of urban skilled and unskilled workers. Skilled and unskilled unemployment rates thus decrease and real wages increase according to the wage curve. Note that in contrast to the FTA case, skilled and unskilled unemployment do not increase with additional liberalization because the overall activity now grows more, and released workers from contracted activities are employed in the expanding sectors. In rural areas, multilateral liberalization is more harmful to the agricultural sector than partial liberalization, due to Arab competition. Consequently, labor demand of unskilled rural workers decreases with respect to the FTA shock, and so does the rural wage. This is contradictory to the result of Cogneau and Tapinos (1995) who found that multilateral trade liberalization reduces the overall economic activity and induces a specialization of the economy in agriculture. Households' real income follows the evolution of rural and urban real wages. Rural household income then decreases and urban household income increases with respect to the FTA shock.

Again, the negative influence of increasing urban real wages on migration incentives is outweighed by the stimulating effect of the exchange rate depreciation. However, migration flows are lower, when compared to the FTA shock. Besides, one can notice that the proportion of skilled migrants in total migrant flow decreases with respect to the growth BAU

path, which could be seen as a contradiction with the HO model. However, when multilateral liberalization is completed, migration flows fall because lower prices further decrease urban and rural consumer price indexes, making real wages higher. Even rural emigration is reduced due to the improvement of the rural wage. Indeed, the greater expansion of the food sector increases the demand for agricultural inputs, hence the lower contraction of the agricultural sector. Internal migration increases motivated by higher urban expected real wage for unskilled workers. Rural and urban households' welfare increases by about 1% and 3.2% of their consumption budget, respectively.

The more people migrate, the more households receive remittances, in spite of urban household's higher income. Like in the FTA shock, the amount received by urban household decreases. But with multilateral liberalization, they decrease more due to lower migration flows and higher household real income.

In sum, the results contradict Cogneau and Tapinos (1995) and show that multilateral trade liberalization is a substitute to migration. In their model, markets are perfectly competitive and only internal migration is modeled endogenously, according to wage differentials. Their conclusion concerning the relation between migration and trade is a logical implication of the fact that gradual multilateral trade liberalization did not succeed to reduce poverty and unemployment. In this paper, urban unemployment rates of skilled and unskilled workers decrease reflecting the absence of any push factor. Migration is first motivated by the high exchange rate depreciation that improves the value of international wage in domestic currency, but decreases later on. This however does not mean that the previous studies are wrong, but shows how some complications to the model are likely to reverse the results.

5.Conclusion

This paper looks to the effects of trade liberalization on the skill composition of migrant flows, giving a new answer to the question with respect to previous works on Morocco. Bouzahzah et al. (2007), and Cogneau and Tapinos (1995) show that trade liberalization and migration are complements. Migration is motivated by push factors such as a lower wage or a higher unemployment rate, resulting from trade liberalization. This paper deals with a new dimension of the question by distinguishing between skilled and unskilled migration. The results show that gradual liberalization lowers rural wage, thus motivating rural migration. However, it improves the situation of skilled and unskilled workers in urban areas. Despite the absence of push factors, skilled and unskilled emigration from urban areas is first motivated by the exchange rate depreciation that raises the value of international wage in foreign currency. However, later on, migration incentives in rural and urban areas are reduced, like in Faini and de Melo (1995), for both skilled and unskilled workers. The multilateral liberalization shock replicates most of the FTA results, but with greater changes in the variables. The overall conclusion from the model simulations is that efforts should be pursued for additional liberalization. With multilateral liberalization, the economy grows more and the results show that the more the economy grows, the more migration flows are able to decrease. The results of this paper are a step forward with respect to the literature, made possible by only some complications that better draw the reality of migration flows and their impact on the economy.

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Figure 1: Migration flows

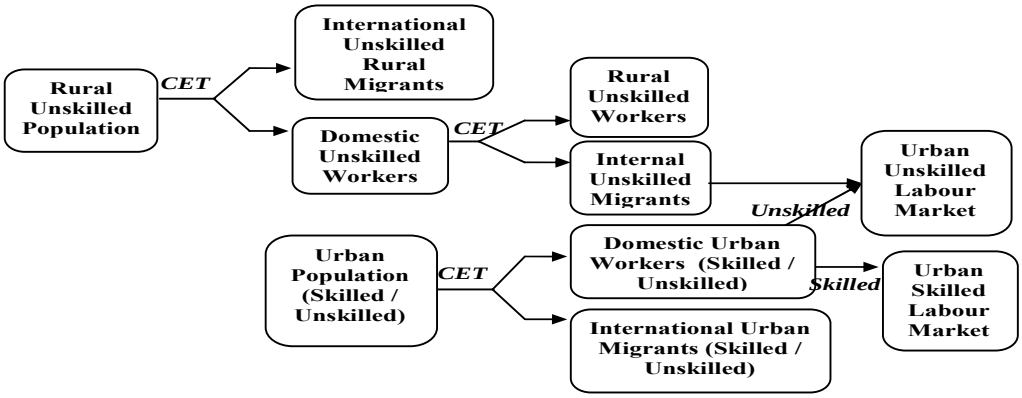

Figure 2: Technology for production activities

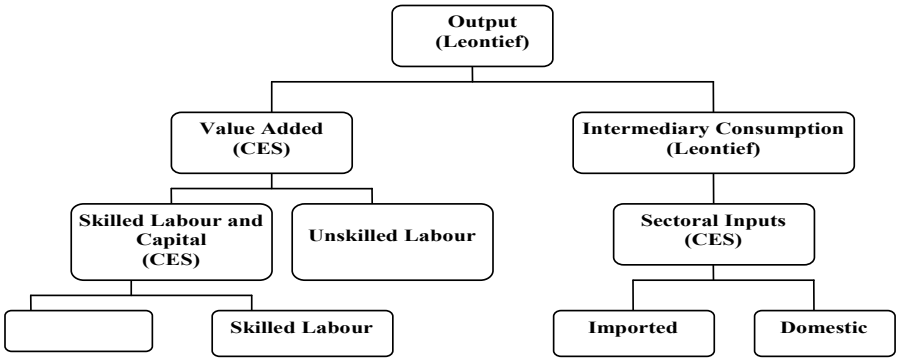

Figure 3 Commodity flows

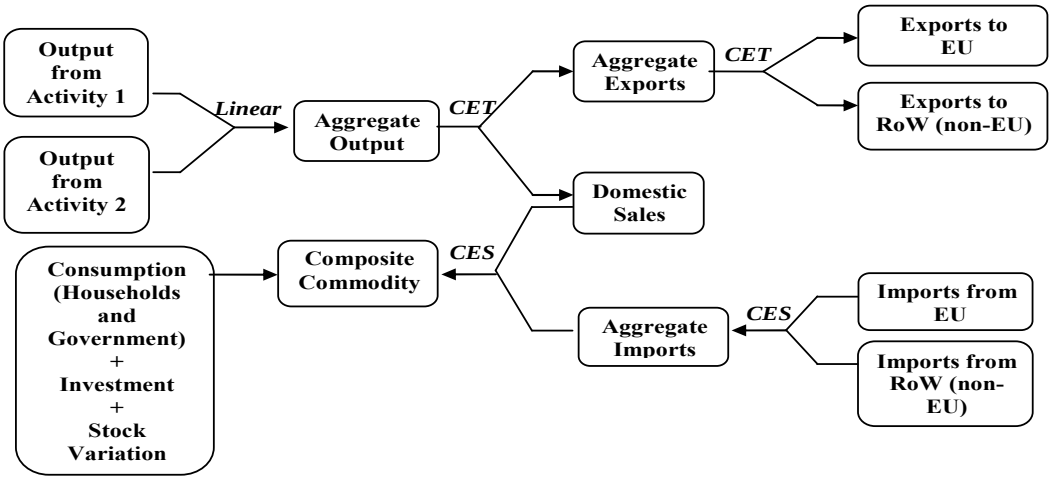

Table 1: External trade and import tariffs, in 2003

Tradable Sectors	Imports (MAD bn)	% from EU	Exports (MAD bn)	% to EU	Tariff Rate (%)	Tariff from EU (%)
Agriculture	3.32	60	36.69	80	72	74
Fishing	0.06	66	2.11	54	3	4
Coal mining	10.83	8	0.00	0	3	0
Metal ore mining	0.16	87	0.46	81	0	0
Other ore	1.66	8	4.12	51	0	0
Food industry	6.91	54	11.07	96	43	40
Tobacco industry	0.50	77	0.00	67	24	21
Textile industry	16.45	71	3.56	61	1	0
Clothing industry	2.21	87	25.20	94	2	0
Leather industry	1.28	90	2.45	72	6	0
Wood products	2.11	31	0.52	84	12	10
Paper industry	2.45	47	0.59	69	5	5
Editing	0.73	47	0.04	68	3	3
Oil refining	10.27	52	0.89	84	5	7
Chemical industry	14.93	67	10.85	29	3	3
Rubber and plastics	3.75	74	0.34	20	10	9
Non-metallic minerals	1.42	77	0.66	45	13	12
Metallurgy	7.32	63	2.08	79	6	0
Metal processing	2.81	63	0.41	79	8	8
Machines and equip.	13.36	70	0.23	80	3	0
Office machinery	2.16	50	0.00	0	2	0
Electrical machines	5.73	67	5.29	66	4	0
Radio and TV	6.60	67	5.99	66	3	0
Medical instruments	1.54	50	0.21	50	3	0
Car industry	6.82	62	0.49	66	11	9
Other transport means	3.74	62	0.12	66	1	0
Other industries	1.84	77	0.53	45	10	0
Electricity and water	0.29	70	0.73	57	0	0
Hotels and restaurants	2.12	70	0.37	57	0	0
Transports services	10.78	70	8.82	57	0	0
Post and telecom	0.47	70	3.23	57	0	0
Financial activities	0.35	70	0.34	57	0	0
Rental services	3.46	70	6.00	57	0	0
Non-financial services	0.20	70	0.01	54	0	0

Source: Imports and exports are calculated from the Moroccan Ministry of External Trade, Rabat. Average applied tariff rates are taken from national accounts. Tariff rates applied on EU products come from Caupin (2005) and from author's calculations based on CEPII's Trade and Production database, available on CEPII's website.

Appendix A: Data

The model data is based on a disaggregated SAM for 2003, to which the model parameters are calibrated. The SAM was constructed on the basis of various data sources, most importantly: the input-output table of the Moroccan economy for 2003, the National Survey on Household Living Standards, documents from the Ministry of Economy and Finance, from External Trade department, from the Ministry of Agriculture, from Foreign Exchange department, and from Bank Al-Maghrib. The SAM gathers two production factors (labor and capital), five types of agents (households, non-financial institutions, financial institutions, the government and the RoW), 39 production sectors. I further decompose the SAM in order to distinguish between rural and urban areas and take into account two categories of households: a rural household offering his working hours to rural sectors and an urban household offering his working hours to urban sectors.

The SAM describes the Moroccan economy in 2003. At this period, GDP amounted to MAD 477 billion. On the output side, the primary and secondary sector are relatively small accounting for respectively 18% and 28% of real GDP. By contrast, the tertiary sector accounts for 54% of real GDP. On the demand side, households consumption accounts for 58% of GDP, while government current expenditures account for 18% of GDP. At the same time, total investment expenditures represent 26% of GDP, implying that Morocco is running a trade deficit equivalent to 2% of GDP. Indeed, exports and imports represent respectively 29% and 31% of GDP. Industrial imports constitute 86% of total imports whereas agricultural products and services only account for 7% of total imports each. Industrial exports are also the most important, about 60% of total exports, followed by agricultural products that represent 25% of total exports whereas services only account for 15% of total exports.

Migration data are taken from several sources:

1- To quantify Moroccan emigration, I resort to the data published by the OECD in 2006 on immigrant inflows by nationality in some OECD countries. I approximate Moroccan emigration by the flows of Moroccan migrants to their traditional destinations, such as Belgium, France, Italy, the Netherlands and Spain. The sum of these flows (102,000 migrants in 2003) is reported to the Moroccan working population of 2003 in order to calculate the annual percentage of emigrants (0.9%).

I also use the stocks of Moroccan migrants in the previous selected countries in order to approximate the stock of migrants necessary to the adjustment of the model in the dynamic framework.

2- According to a report of the International Organisation of Migration (Erf and Heering 2002), Moroccan emigration towards European countries originates more from rural areas. I suppose that 60% of the national emigration flow/stock take place from rural areas and 40% from urban areas.

3- Agénor and El Aynaoui (2003) point out that each year, around 200,000 workers migrate from rural to urban areas. This corresponds approximately to 4% of the 2003 rural working population.

4- Finally, for lack of data on skilled and unskilled migration, I resort to OECD data on migrant stock by educational level in 2005 in order to calculate the stock of skilled migrants (26% of total migrant stock). The percentage of skilled flows (31% of total migrant flows) is calculated from Hamdouch (2005). Skilled wage premium for migrants is calculated on the basis of a weighted average of skilled wage premium in the main OECD countries receiving Moroccans. This results in a wage of 1.5 times higher for skilled migrants with respect to unskilled ones. Skilled wage premium in Morocco is calculated from the Investment Climate

Assessment study by the World Bank and the Moroccan Ministry of Industry and Trade (Royaume du Maroc, 2005). Moroccan skilled wage premium is also evaluated at 1.5.

Trade data comes from various sources: aggregate exports and imports by product are taken from the SAM. Export and import percentages to and from the EU are calculated using data from the Moroccan Ministry of External Trade, Rabat. Average applied tariff rates are taken from national accounts. Tariff rates applied on EU products come from Caupin (2005) and from author's calculations based on CEPII's "Trade and Production" database, available on CEPII's website. This database is based on the data of Nicita and Olarreaga (2001) coming from the United Nations sources: COMTRADE and UNIDO. Despite a wide coverage, the World Bank files contain a lot of missing values for production figures in recent years. This is the reason why the Trade and Production database was largely extended using more recent versions of the UNIDO CD-ROM together with OECD STAN data for OECD members. Regarding trade data, the mirror inflows, available in Nicita and Olarreaga (2001), were used with the CEPII database on international trade (BACI), which is also based on COMTRADE data. The data used is a cross section in 2001.

The calibration procedure is more difficult in an imperfect competition market structure. Baseline values are needed for fixed costs, the number of firms, and the perceived price elasticity of demand. None of these are given in the original SAM. Furthermore, those variables are linked within sectors by the zero-profit constraint. It is also easy to show that the price elasticity of domestic demand depends on Armington elasticities (Cockburn et al. 1998). Consequently, two of them are taken from external sources and the third one is calibrated. In the Moroccan case, no information is available on the number of firms by sector. Therefore, it is calibrated from Armington elasticities and the scale parameter. The scale parameter is set to 1.05, which is equivalent to say that fixed costs account for 5% of total costs by firm.

Finally, the following parameters are imported from external sources: the absolute value of the wage elasticity with respect to unemployment is fixed to 0.1[19], transfer costs represent 9% of the amount of the transaction (Barendse, Hiddink, Janszen and Stavast, 2006) and the capital depreciation rate is set to 8% (Agénor and El Aynaoui 2003). CES Armington function elasticities for aggregation of imports from different regions and of imports and domestic output are respectively set to 5 and 2. CET function elasticities for transformation of domestic output to aggregate exports and domestic sales, and of aggregate exports to exports disaggregated by region are set to -5 and -8 respectively. These elasticities are borrowed from the literature on Morocco (Lőfgren et al. 1999; Rutherford et al. 1997). The annual growth rate for public expenditures (3.5%) is calculated using data from national accounts. The rural population natural growth rate (2.6%) is taken from Agénor and El Aynaoui (2003). The urban population natural growth rate (0.8%) is based on author's calculations. For lack of data, exogenous transfers to and from households as well as minimum consumption by product are supposed to grow at the population growth rate.

[19] Blanchflower and Oswald (1995) showed that the relation between wage and unemployment rates is stable among countries and through time with an elasticity around -0.1.

Appendix B: Selected Results

Table 2: The BAU growth path – long run (Percentage change with respect to the base year)

	t	t+5	t+10	t+15
Economic growth				
Real GDP at factor cost	0.00	12.26	34.70	65.98
Real GNP	0.00	10.73	29.28	55.60
Real wage				
Rural	0.00	9.96	22.17	37.48
Urban unskilled	0.00	2.09	10.67	29.44
Urban skilled	0.00	3.06	11.22	53.61
Unemployment				
Unskilled	0.00	-18.71	-63.71	-92.43
Skilled	0.00	-26.01	-65.46	-98.63
Migration flows				
Rural	0.00	-1.08	-11.27	-28.71
Urban unskilled	0.00	12.43	-1.03	-23.77
Urban skilled	0.00	-2.13	-21.53	-44.66
Internal	0.00	-11.60	-5.90	-6.28
Household real disposable income				
Rural	0.00	6.11	13.13	20.72
Urban	0.00	11.27	33.23	66.78
Remittances				
To rural household	0.00	2.16	-6.78	-25.10
To urban household:				
From unskilled migrants	0.00	32.81	-7.10	-58.81
From skilled migrants	0.00	-37.76	-67.31	-84.62
External trade				
Total export volume	0.00	14.73	48.93	99.20
To the EU	0.00	13.53	44.01	87.56
To the RoW	0.00	17.93	62.08	130.30
Total import volume	0.00	11.58	37.14	76.61
From the EU	0.00	11.55	37.33	77.33
From the RoW	0.00	11.61	36.86	75.51
Real exchange rate	0.00	2.06	1.59	-0.28

Source: Author's calculations.

Table 3: Economic growth (Percentage change with respect to the BAU growth path)

	T	t+5	t+10	t+15
Gradual FTA – Long Run				
Real GDP at factor cost	0.05	0.09	-0.09	-0.43
Real GNP	-0.10	-0.03	-0.17	-0.42
Gradual FTA – Short Run				
Real GDP at factor cost	0.04	0.13	0.06	-0.24
Real GNP	-0.10	-0.03	-0.10	-0.32
Gradual MULTI - Long Run				
Real GDP at factor cost	0.09	0.35	0.52	0.44
Real GNP	-0.17	0.10	0.26	0.33
Gradual MULTI - Short Run				
Real GDP at factor cost	0.08	0.45	0.87	1.01
Real GNP	-0.17	0.11	0.45	0.72

Source: Author's calculations.

Table 4: Real wage (Percentage change with respect to the BAU growth path)

	T	t+5	t+10	t+15
Gradual FTA - Long Run				
Rural	-0.80	-0.88	-1.03	-0.16
Urban unskilled	0.07	0.20	0.09	-0.46
Urban skilled	0.02	0.06	0.02	-0.95
Gradual FTA - Short Run				
Rural	-0.76	-0.51	-0.39	0.24
Urban unskilled	0.10	0.31	0.39	1.29
Urban skilled	0.02	0.07	0.06	-0.56
Gradual MULTI - Long Run				
Rural	-1.33	-1.20	-1.19	0.07
Urban unskilled	0.12	0.50	0.88	0.77
Urban skilled	0.03	0.13	0.26	0.81
Gradual MULTI - Short Run				
Rural	-1.24	-0.58	-0.11	1.16
Urban unskilled	0.18	0.75	1.55	3.19
Urban skilled	0.03	0.15	0.35	3.07

Source: Author's calculations.

Table 5: Migration flows (Percentage change with respect to the BAU growth path)

	T	t+5	t+10	t+15
Gradual FTA - Long Run				
Rural	0.00	1.16	0.09	-0.05
Urban unskilled	0.00	0.38	0.55	1.43
Urban skilled	0.00	0.71	0.29	0.78
Internal	0.00	3.29	1.01	-1.24
Gradual FTA - Short Run				
Rural	0.00	0.74	-0.69	-1.24
Urban unskilled	0.00	-0.32	-0.77	-0.32
Urban skilled	0.00	0.24	-0.65	-0.55
Internal	0.00	3.19	0.85	-1.74
Gradual MULTI - Long Run				
Rural	0.00	1.12	-1.37	-2.70
Urban unskilled	0.00	-0.61	-1.97	-1.57
Urban skilled	0.00	0.23	-1.42	-1.82
Internal	0.00	5.62	3.46	0.47
Gradual MULTI - Short Run				
Rural	0.00	0.28	-2.99	-5.14
Urban unskilled	0.00	-2.10	-4.76	-5.25
Urban skilled	0.00	-0.76	-3.39	-4.56
Internal	0.00	5.74	3.72	0.18

Source: Author's calculations.

Table 6: External trade (Percentage change with respect to the BAU growth path)

	T	t+5	t+10	t+15
Gradual FTA - Long Run				
Total export volume	1.01	3.82	4.91	3.95
To the EU	1.04	4.15	5.70	4.88
To the RoW	0.95	2.98	3.04	1.93
Total import volume	0.37	3.15	4.51	4.01
From the EU	2.25	9.47	12.87	11.97
From the RoW	-2.46	-6.41	-8.19	-8.16
Real exchange rate	0.72	0.48	0.55	0.16
Gradual FTA - Short Run				
Total export volume	0.97	3.75	5.06	3.61
To the EU	1.00	4.07	5.89	4.73
To the RoW	0.91	2.93	3.06	1.11
Total import volume	0.36	3.00	4.49	3.74
From the EU	2.23	9.29	12.84	11.72
From the RoW	-2.48	-6.53	-8.21	-8.47
Real exchange rate	0.67	0.38	0.31	-0.14
Gradual MULTI - Long Run				
Total export volume	1.85	7.04	9.86	9.42
To the EU	1.91	7.72	11.61	12.05
To the RoW	1.69	5.30	5.70	3.69
Total import volume	0.76	5.84	9.01	9.38
From the EU	-0.91	0.09	0.89	1.15
From the RoW	3.29	14.54	21.37	21.98
Real exchange rate	1.17	0.39	0.17	-0.47
Gradual MULTI - Short Run				
Total export volume	1.75	6.94	10.29	9.58
To the EU	1.81	7.62	12.14	12.48
To the RoW	1.60	5.19	5.83	3.08
Total import volume	0.71	5.57	9.10	9.47
From the EU	-0.96	-0.17	0.96	1.19
From the RoW	3.24	14.25	21.48	22.15
Real exchange rate	1.05	0.15	-0.36	-1.14

Source: Author's calculations.