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Labor Markets in Regional Trade Agreements: What Do We Know? *

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Abstract

Globalization has failed to relax barriers to the movement of labor, especially unskilled workers. So have North-South Regional Trade Agreements (RTAs), while South-South RTAs have failed to implement good intentions. A literature review of the labor effects of RTAs underscores context specificity precluding generalizations across categories of RTAs. Most ex-ante studies have focused on global welfare effects rather than anticipated labor market effects while ex-post studies have had difficulty isolating any direct effects attributable to implementation of the RTA because of confounding effects as illustrated by a discussion of the wage puzzle in Mexico under NAFTA. The survey reviews labor market and wage results from ex-ante CGE estimates and ex-post household-based econometric estimates. ... / ...

Keywords : Regional Trade Agreements, Labor markets.

JEL Categories : F18 and Q56

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... /... A review of the response of manufacturing firms and plants to the large reductions in tariffs under CUSFTA, MERCOSUR, and NAFTA reveal significant adjustments. Under CUSTTA, in Canadian manufacturing short-run employment losses were large while productivity gains were equally large and the market access to the US led Canadian firms in the bottom of the distribution of labor productivity to engage in investment in technology upgrading. In MERCOSUR and NAFTA, an upgrading in technology was also observed among the firms that were led to enter (or to increase) their exports to RTA partners (Brazil for Argentine firms and the US for Mexican firms). These firms also increased their demand for skilled labor suggesting that the FTA contributed to an increase in the skill premium.

1. Introduction

Globalization has secured three of the four fundamental economic freedoms: movement of goods, movement of capital and movement of services (excluding the movement of persons). As to the movement of persons, however, developed and developing countries have been reluctant to open borders mostly for unskilled labor, except in situations of shortages. This situation is in sharp contrast with the desire to promote capital mobility as reflected in over 2,500 bilateral investment treaties (UNCTAD (2010)). The resulting asymmetry means that globalization has been largely to the benefit of developed countries that have been able to export their capital (and repatriate the resulting earnings) under the welcoming investment regimes while developing countries have been prevented from exporting their people and realizing the associated gains. In short, the 'direct route' to higher wages, less inequality and higher productivity resulting from labor mobility to developed countries has largely been shut.

Faced with this situation, and with the evidence that the fast-growing East-Asian countries had followed export-led policies under an open trade regime, many developing countries joined and, even led, the wave of liberalization that swept the world trading system starting in the middle 1980s. At first, they reduced trade barriers, especially tariffs which now stand at 3 per cent for developed countries and are in the 5-15 percent range for developing countries (WTO Report 2011, figure D1). This reduction took place unilaterally, but also on a preferential basis, mostly among neighboring countries, and often in partnership with developed-country partners (e.g., NAFTA, EU enlargements).

Initially, the preferential trade agreements concerned mostly an 'exchange of market access', which was easier to gain support for since the exchange was mostly at the expense of excluded third-countries. Much work has been carried out to assess the three components of this preferential reduction in tariffs: the higher price for partners that have received preferential access, the lower price for excluded third-countries and the possibility that the preference-granting country might see its welfare deteriorate as the removal of one distortion (trade barrier on the importer) is accompanied by the imposition of another (discrimination between partners). Numerous studies

have tried to quantify these effects, often ex-ante on the basis of simulation models, and more recently ex-post largely drawing on the gravity model of international trade. In these evaluations reviewed in section 3 below, focus is mostly on the trade and welfare effects, with only a few reporting the labor-market effects.

Progressively preferential access has lost in importance. Currently less than 13 percent of preferential trade benefits from a competitive advantage exceeding 2 percentage points (World Trade Report, 2011). Thus, as first noted by Ethier (1998a and 1998b) and recently emphasized by Baldwin (2011), the new bargain became “foreign factories for domestic reforms”. This is reflected in the new wave of Preferential Trade Agreements (PTAs) that go beyond ‘shallow integration’ involving only the reduction of barriers to trade to ‘deep integration’. In this fast-lane landscape, rule-making is beyond reduction on border measures. If integration is sufficiently deep, it can create a regulatory regional bloc that can be largely non-discriminatory as it does not require rules of origin. Then the regulatory environment is trade creating (some call it ‘reverse trade creation’) since third parties also benefit from regulatory harmonization.

With this deepening integration, the channels through which the labor market is affected by PTAs become harder to identify. Integration leading to identical standards could increase trade among partners independently of preferential access. Greater policy predictability for a Southern partner in a PTA involving deep integration with a Northern partner could lead to increased FDI as it was the case for Mexico under NAFTA and under the Southern and Eastern enlargements of the EC. This kind of deepening would likely have important effects on the labor market. Likewise, a reduction in trade costs could lead to greater outsourcing across partners and vertical as well as horizontal foreign investment, each with different implications for the labor market. In sum, the much larger agenda in the new RTAs coupled with the loss of importance of market access, complicates any review of the labor market effects of RTAs.

Faced with this plethora of channels through which a regional trade agreement could affect the labor market and the fact that many countries (especially developing countries which are the focus of this survey) have been subjected to macroeconomic shocks, this survey has to be selective. We have decided to put the emphasis on two aspects: first the mechanisms through which the labor market is affected by regional integration (taking into account that this integration typically goes beyond eliminating barriers to trade in goods); second, wherever possible, we report selected estimates to give the reader an idea of likely orders of magnitude.

Section 2 starts with a description of the measures negotiated in RTAs, especially those that go beyond coverage at the multilateral negotiations. Emphasis is on factor mobility and more specifically on labor market measures taken in some of the major RTAs. The remainder of the paper deals with estimates reported in the literature with pride of place accorded to NAFTA both because it involves a Northern and a Southern partner, as has been the case in many instances under the new wave of regionalism, but also because it shows how difficult it is to isolate the effects of NAFTA from other factors that impacted the labor market. Section 3 is devoted to the voluminous

literature on Computational General Equilibrium (CGE) ex-ante estimates indicating the variety of labor market effects they can be expected to capture. Section 4 discusses the alternative explanations that have been advanced to explain the sharp changes in the Mexican labor market following NAFTA and reports on estimates obtained from household surveys which capture the effect of Mercosur and NAFTA on wages. Section 5 turns to firm and plant level estimates. These studies that have tried to identify the labor market effects of reciprocal preferential market access exploit the variation in tariff reductions across sectors under the CUSFTA, NAFTA and MERCOSUR agreements and show how firms have reacted to changes in market access.

2. Deep RTA Provisions and the Labor Measures in Preferential Trade Arrangements

The economic effects of labor mobility are well-understood as are the political-economy reasons for opposition to it by governments. In host countries, capitalists gain more than labor while the opposite occurs in sending countries. However, once remittances are taken into account, the gains for migrants have been estimated to be far greater than the losses their departure cause to sending countries. According to World Bank estimates, remittances to developing countries in 2007 accounted for 0.7% of world GDP under the “3% scenario” increase in the work force of developed countries (Global Economic Prospects, 2006) ¹. This is why it is recognized that the temporary movement of persons would be the first-best development strategy (Pritchett, 2006; Winters, 2008). However, no progress on the temporary movement of persons has occurred at the Doha Round, these negotiations only covering skilled professionals (business visitors and salespersons; intra-corporate transferees; independent professionals; contractual service suppliers). Should one expect PTAs to lead to more progress than at the multilateral level? Drawing on close to three hundred PTAs in force, Bergstrand et al. (2011) have studied the pattern of PTA formation. They find that the probability of PTA formation among pairs of countries is greatest among natural trading partners (i.e. close in terms of geographical distance), country pairs with large GDPs, and country pairs with similar economic size. If one adds common language or close cultural ties, these are also the characteristics one would expect would lead to the adoption of provisions for labor mobility.

Before 1995, most PTAs concerned only trade in goods and involved mainly tariff liberalization. Now, the domain of negotiations in PTAs has followed the agenda of the multilateral negotiations at the WTO to include trade in services and trade-related aspects of intellectual property rights. Moreover, as shown in the World Trade Report (2011), the provisions in recent RTAs often go deeper than WTO measures, and include provisions in areas not currently covered by the WTO agreements such as investment protection, competition policy, but also labor standards and capital mobility measures. Table 1 gives an overview of ‘deepness’ of integration in terms of provisions covered for the main PTAs involving developing countries. It shows much greater

¹ See Appendix 1 in Stephenson and Hufbauer (2011) for a summary of the welfare estimates from the movement of persons and for an explanation of why the gains for developed countries are less once remittances are taken into account.

willingness at commitments to promote capital mobility and investment flows than to promote labor mobility.

Table 1: Main Labor-market related Provisions in major Regional Trade Agreements.

RTA	Number of countries	Number of WTO+ and legal enforcement	Number of WTO-X and legal enforcement	Provisions on factor mobility ●Investment measure, ●Labor Market Regulation, ●Movement of Capital, ●Intellectual Property Rights (5)	Labor Mobility measures (6)
Column (1)	(2)	(3)	(4)	(5)	(6)
ASEAN	10	2 ²	0 ⁰	None	- Mutual Recognition Agreement - Mode 4 of GATS
COMESA	20	10 ⁷	19 ⁴	Investment measure Labor Market Regulation Movement of Capital	
ECOWAS	15	7 ⁵	13 ³	Investment measure, Movement of Capital	- Harmonizing of passports. - Joint operations at borders for customs and migration officers
MERCOSUR	5	9 ⁹	3 ³	Movement of Capital Intellectual Property Rights	- Agreement on Residency: Promote the right to work and to carry out any legal activity for the citizens of the Mercosur Community
NAFTA	3	14 ¹⁴	8 ⁷	Investment measure Labor Market Regulation Movement of Capital Intellectual Property Rights	- "Temporary Movement of Business Persons" - TN visa -Annex on professionals: mutual recognition and definition of mutually acceptable standards and criteria.
SACU	5	7 ⁴	4 ⁰	None	
SADC	15	11 ¹⁰	1 ⁰	None	
EC (27)	27	9 ⁹	11 ¹¹	Investment measure Labor Market Regulation Movement of Capital Intellectual Property Rights	- Labor mobility is guaranteed

Source: Author's compilation. Cols 3-5 from appendix Table D1 WTO (2011). Col. 6 from Stephenson and Hufbauer (2011).

***Notes:** Entries in the cells in columns (3) and (4) are the number of provisions in the corresponding column; exponents refer to the number of WTO+ and WTO-X provisions that are legally enforced, as defined by Horn et al (2010).

Columns (2) and (3) report the number of additional measures included in each agreement. The list is based on a classification proposed by Horn, Mavroidis, and Sapir (2010) and by the World Trade Report (2011). So-called "WTO+" provisions concern commitments that already exist in WTO agreements but go beyond the WTO disciplines. "WTO-X" provisions cover issues lying outside the current WTO mandate. These include Investment measures, Labor Market Regulation and Movement of Capital². The table distinguishes between the measures only mentioned in the PTA and those which are qualified as "legally enforceable" by the authors³. Despite a willingness of developing countries to increase market integration, the agreements which involve developed

² The classification is largely based on the article headings in the case of the EC agreements, and on the chapter headings in the case of the US agreements.

³ As Horn et al. (2010) argue, measures which are identified to be legally enforceable are more likely to be implemented.

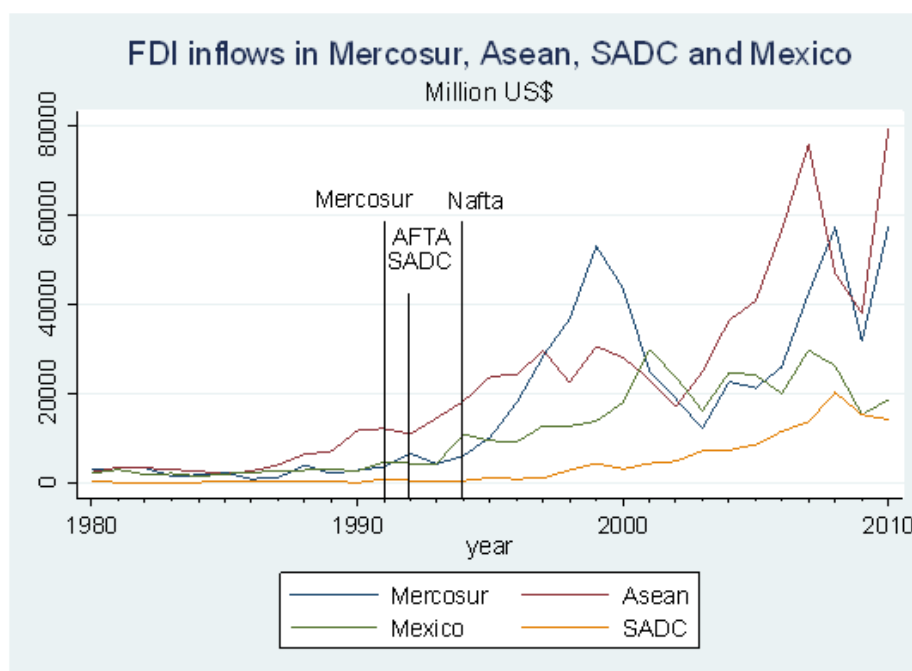
countries, e.g. NAFTA and the European Union, remain those that are the deepest in terms of the number of additional measures legally enforceable.

Four deeper WTO-X disciplines appear in over one third of RTAs. These are: competition policy (47%), the movement of capital (39%), intellectual property rights not in the TRIPs Agreement (37%), and Investment (31%). This pattern reflects the fundamental change in the World Trading System mentioned earlier whereby developing countries are carrying out reforms unilaterally to attract foreign capital. This rush to join the global value chain also explains the explosion of Bilateral Investment Treaties (BITs) that are close to five times the number of RTAs⁴. It also explains why the bulk of tariff reductions have taken place unilaterally rather multilaterally, especially in fast-growing Asian economies. Vezina (2010) shows that the last two decades of unilateral tariff-cutting in Asia's emerging economies has been mostly driven by a 'race-to-the-bottom' competition to attract foreign (mostly Japanese) FDI.

Most information on deep RTA provisions relate to FDI. Figure 1 shows the evolution of FDI for some of the major RTAs (Mexico, MERCOSUR, ASEAN, SADC) along with the dates when the RTA came into force. Case studies have sought to document whether the agreement ushered a significant change in flows and to see if there was an upturn in FDI around (or a few years before) the date when the treaty came into force. RTAs, through tariff liberalization and the WTO-X measures, should attract FDI and lead to a reduction in uncertainty about policy environment in the host country. Indeed, integration agreements, especially those involving Northern and Southern partners as in the case of NAFTA and the Europe Agreements signed by the EU with the CEECs (future EU members) are more likely to bind future regimes to reforms undertaken and to specific provisions of the agreement than would be the case under unilateral trade liberalization. Thus it can help alleviate the well-known time inconsistency problem whereby governments have an incentive to impose a higher tax rate *ex post* although they had committed to national treatment for foreign investors *ex ante*.

⁴ Fernandez and Portes (1998) and Schiff and Winters (2003, chp. 4) discuss how Bilateral Investment Treaties and RTAs in general provide a stimulus to investment. Typically, BITs include non-discrimination (Investments abroad are to be treated as favorably as the host party treats its own investors (national treatment), limits to expropriation, guarantee of transferability of investment-related funds measures and dispute settlement provisions. There are over 2,500 (Baldwin, 2011, figure 7).

Figure 1: The Surge in Worldwide FDI Flows



Source: OECD (2011) database.

CUSFTA appears to have led to a reduction in intra-regional FDI for both the US and Canada and therefore to a substitution from FDI to exports within the region over the period 1986-1995. However, the opposite is observed for developing countries. Intra and extra-regional inflows rose for Mexico under NAFTA. This pattern of increased FDI in the Southern partner was also observed during the first EC Southern enlargement for Portugal and Spain (but not for Greece).⁵ A similar pattern of FDI augmentation was observed under MERCOSUR as FDI more than tripled between 1989 and 1993 but that the inflow was mostly towards Argentina and Brazil.⁶

⁵ No increase in inward FDI was observed in Greece following accession in 1981. For Spain, FDI which average 1.5% of GDP over 1980-85, rose to 3% by 1990. The same increase was observed for Portugal, as inward FDI rose to 4% of GDP by 1990. The lack of change in Greece has been attributed to its distorted policy environment. See Lederman et al. 2005, chp. 5, box 5.1

⁶ Blomstrom and Kokko (1997) discuss these patterns in greater detail. Kubny et al (2008) also note that FDI inflows were stimulated for MERCOSUR, ASEAN, SAARC and SADC RTAs but argue that country-specific factors (i.e. macro policies and regulatory environment) were more important for the stimulus than regional integration.

Several studies have tried to isolate the impact of RTAs on FDI flows finding a significant positive correlation between RTAs and bilateral FDI flows between members. The studies also find that the response of FDI to an RTA depends largely on the similarities between countries and the locational advantages of the participating countries and industries⁷.

Turning to the mobility of labor, there has been no progress in opening labor markets at the multilateral level under the WTO GATS since the commitments made at the Uruguay round and the negotiations on labor market access have only covered skilled professionals (business visitors and salespersons; intra-corporate transferees; independent professionals; contractual service suppliers). In international services trade, labor mobility is conceptualized as the *temporary* movement of natural persons or Mode 4, which the WTO GATS defines as the supply of a service by a service supplier of one Member, through presence of natural persons of a Member in the territory of any other Member (Art. I.2(d))⁸.

Column (6) in table 1 displays the main measures on labor mobility in RTAs identified by Stephenson and Hufbauer (2011). Most PTAs involving developed countries do not go beyond what is set out in members' WTO schedules whereas developing countries often contemplate completely liberalized markets as part of their agreements. Starting with PTAs involving developed countries, the North American Free Trade Agreement (NAFTA-1994) contains a chapter entitled "Temporary Movement of Business Persons" whose purpose is to facilitate temporary entry for business people between the United States, Canada, and Mexico who are involved in goods or services trade or in investment activities. For some categories of skilled workers, there is no limit on the number of visas and a work permit is not required. The novel migration component of NAFTA is the TN visa permits that can be delivered upon demonstrating proof of a job offer and permits employment for one year with unlimited renewal. In addition, an Annex on Professionals service suppliers promotes the development of mutually acceptable standards and criteria for licensing and certification of professional service suppliers based on factors such as educational background, qualifying examinations and experience and enhance the process of mutual recognition.

⁷ Using a gravity model, Levy Yeyati et al. (2003) find a significantly positive average impact of regional integration agreements on bilateral FDI between members (FDI from 20 source countries, all OECD, to 60 host countries, from 1982 through 1998). See also Kreinin and Plummer (2008) and MacDermott (2007). As Blomstrom and Kokko (1997), MacDermott finds a negative impact of CUSFTA on Canada-US bilateral FDI flows. Tekin-Koru and Waldkirch (2010) use a control group approach to estimate the changes in FDI flows to Mexico under NAFTA. They estimate that inward FDI into Mexico from the US and Canada increased substantially after NAFTA (27%), but not so for FDI coming from other countries. They attribute this result to the Maquiladoras program before NAFTA and to strict rule of origins which imposed minimum sales values originating in NAFTA to qualify for NAFTA status. Baltagi et al. (2008) find that RTA membership with a European host country leads to a relocation of FDI flows from other countries in the EEA towards RTA members and they estimate that the ratification of the EA amounted to about 120%–135% of FDI of the Western European parent countries in the involved CEEC. In comparison, the negative indirect effects on third host countries are small but ubiquitous in Europe.

⁸ The discussion here draws on Stephenson and Hufbauer (2011). Negotiations on Mode 4 (i.e. on the temporary movement of natural persons to perform a job in another country) do not define 'temporary' which could be between a few weeks and a few years depending on the particulars of the trade negotiation. Lederman, Maloney and Serven (2005, chp. 5) describes in detail the NAFTA measures in the labor market.

Between Members of the European Union, total labor mobility is guaranteed, but only after 10 years with respect to some of the newest EU members. Although the EU has numerous Association Agreements in place with neighboring Mediterranean countries (Morocco, Tunisia, Egypt, Jordan, Turkey, Syria and others), these agreements focus on goods and have not yet incorporated provisions on services.

In West Africa, the ECOWAS Treaty requires the Community to ensure the removal of obstacles to the free movement of persons, goods, services and capital, and to guarantee the right of residence and establishment. However, despite the signature of three protocols in this regard, implementation within ECOWAS has been slow, hampered in particular by efforts of young member states to affirm their sovereignty and by adverse reactions to the influx of foreign labor in periods of recession (OECD, 2008). In recent years, several measures have been undertaken in particular the harmonizing of passports since 2000, and joint operations at borders for customs and migration officers.

In Latin America RTAs, as in Southeast Asia, progress towards liberalizing labor mobility has been slow. MERCOSUR members included the freedom of movement among their integration goals although the right to work was to be regulated by host governments. In a study on the labor market structure of MERCOSUR countries over the 90's, Galiani and Sanguinetti (2003) argue that no official attempt to move in the direction of integration of the labor markets across the MERCOSUR countries took place. They document appreciable differences among the labor market institutions and, more generally, between Argentina and the rest of the MERCOSUR members. According to the authors, to improve labor mobility in the region, MERCOSUR countries and Argentina in particular, should adapt their labor regulation in terms of wage bargaining and labor standards⁹. In December 2002, MERCOSUR leaders signed an Agreement on Residency for MERCOSUR Nationals which aimed at providing them equal civil, social, cultural and economic rights and include the right to work and to carry out any legal activity across the MERCOSUR area. However, much of the migration that occurs in the MERCOSUR region is still outside formal channels. This throws doubt over the extent of implementation of these measures.

ASEAN members have made only very modest commitments on Mode 4 in their respective schedules of services commitments and many of the Mode 4 commitments go no further than what is set out in members' WTO schedules. ASEAN has, however, made more progress with the realization of mutual recognition agreements (MRAs) than any other regional grouping, having signed six MRAs to facilitate the movement of professional service suppliers through the recognition of their professional accreditations.

⁹ For example, compared to other MERCOSUR members, Argentina has stronger representative Labor Unions, a highly centralized direction of wage bargaining and a lower severance payment. Galiani and Sanguinetti (2003) argue that Argentina needs to move, as its regional partners did, to a decentralization of wage bargaining at the level of the firm to increase flexibility and adapt its labor market to the greater competition due to the agreement.

3. Ex-ante General Equilibrium Estimates

CGE models have long been used to estimate ex-ante the expected benefits and costs of tariff reforms, especially 'shallow' RTAs, i.e. FTAs or CUs.¹⁰ In fact, they are the preferred (perhaps the only) tool to estimate ex-ante the likely effects of a PTA. The contributions here are numerous starting with estimates of the successive enlargements of the EU, then of other FTAs, with many contributions during the NAFTA debate. We sample some contributions here with an eye on labor market predictions. Because some key assumptions are common to all models and these have an effect on the labor-market predictions generated by the models, we start by reviewing these. We then survey their contributions to the NAFTA debate before presenting a few examples in table 2. We close with a discussion of what kind of ex-post check one might want to apply to CGEs.

3.1. Why Labor market Effects are rarely reported in CGE estimates

Besides the obvious that ex-ante no other tools are available to trace the labor market consequences of an RTA, several factors contribute to the well-deserved popularity of CGEs. First, even if the RTA is 'shallow', i.e. an FTA or a CU, the effects of eliminating tariffs and their equivalents across-the-board is a general equilibrium problem involving interactions across goods and factor markets. Second, the models incorporate two-way trade which is observed in all trade statistics. This is important since trade liberalizations across the world have been accompanied by increases in intra-industry (rather than inter-industry) trade. Third, by careful calibration, several model closures (e.g. perfect competition with constant returns to scale vs. imperfect competition with increasing returns to scale) can be easily accommodated as well as several approaches to trade liberalization. The same applies to checking the sensitivity of results to key parameter values. Fourth, the transparent general equilibrium market structure underlying most models also means that as more reliable data become available, new extensions such as firm heterogeneity or product variety can be incorporated into a suitably modified model.¹¹

¹⁰ Literally scores of CGE models have been used to inform the policy debate across all areas where general equilibrium interactions are key: trade policy, public finance, structural adjustment, income distribution, mitigation to climate change. For many problems such as the labor market effects of an RTA, static rather than dynamic models are used. The models are based on a social accounting matrix (SAM) that describes the income and expenditures of all 'institutions' in the economy (households, firms, the government, the rest-of-the-world). Importantly, this base year is assumed to represent an equilibrium in the economy under maximizing behavior. This means that share parameters for functional forms and tax rates are taken from the SAM while elasticity parameters describing the curvature of production, consumption demand, import demand and export supply are taken extraneously from the literature and 'calibrated' to the model so that the SAM describes an equilibrium subject to the assumed market structure (perfect competition, monopolistic competition or contestable markets in the case of international trade) and 'macro closure' rule (e.g. capital mobility across sectors and/or countries, assumptions about savings/investment, or the possibility of a fixed wage in terms of the numéraire). Under perfect competition, the models are Walrasian, i.e. homogenous of degree zero in all prices. Under imperfect competition and/or different 'macro closures', this property doesn't hold. For some, this means adding realism to give better informed results for policy debate, while for others it is going beyond the micro-foundations from which the models are built. Flexibility allowing for different 'macro closures' is also a plus since one can easily consider the effect of a change in assumptions (e.g. an exogenous increase in FDI following an RTA or fixing the wage). Once calibrated to the base year, the model (single-country or multi-regional) is then solved following the policy change (a unilateral or preferential tariff reduction).

¹¹ Dixon and Jorgenson (2012) is an up-to-date handbook of key developments in CGE modeling over the last thirty years. Balistreri and Rutherford (2012) discuss ways to incorporate (data permitting) recent development in trade theory such as heterogeneous firms.

This said, results from CGE estimates have rarely focused on the labor market consequences of RTAs. Indeed, in Vinerian tradition, ex-ante effects of regional integration have always focused on welfare, i.e. on the expected magnitude of trade creation and trade diversion from preferential tariff reductions in goods markets. This lack of focus on labor markets effects comes from the modeling assumptions that determine the results of the simulations which are rarely instructive for someone interested in the labor market consequences of an RTA. Here are the main reasons.

First, the results for the labor market are quite predictable from the models' assumptions because the labor market is specified parsimoniously: labor supply is fixed and a uniform labor-market clearing wage balances labor supply and demand for each labor category included in the model (often one, but rarely more than two or three labor categories). With no involuntary unemployment and no labor supply decision, by construction any economy-wide employment effects are excluded. Since employment is a derived demand, any changes in relative factor rewards then result from differences in the factor-intensity (direct and indirect) of production across sectors. For example, if protected sectors are intensive in the use of unskilled labor, a removal of protection lowers the relative returns to unskilled labor, but not by much once indirect linkages which attenuate direct changes are taken into account.

Second, on the demand side, labor demand is determined by wage-taking profit maximizing firms facing a nested CES production function. While adding flexibility to the production structure is possible, it requires the calibration of too many parameters and is, in effect, intractable.¹² Modeling wage-setting labor unions is also a possibility, but it is likely to give small effects in general equilibrium. In sum, there are few alternatives in the labor market formulation in CGEs and given the robustness of labor market results to removing protection, it is not surprising that labor markets are rarely reported.¹³

In the end, the only alternative to the standard modeling of labor markets that is occasionally explored in some models is fixing the 'nominal' wage (i.e. fixing the wage in terms of the numéraire). As shown in table 2, this constraint, if binding, can then generate employment effects if the reduction in protection generates an excess supply of labor and the real (product) wage is not allowed to adjust downward.

¹² Boeters and Savard (2012) survey the modeling of labor markets in CGEs. They show the paucity of choices and justify the usual specification described here when the focus is on the labor market effects of trade reforms. They also show in section 4.1 that implementing a non-separable non-nested CES with capital, intermediates and three categories of labor requires calibrating 26 parameters.

¹³ In one of the first studies concerned with the specification of labor markets in trade-focused CGE models de Melo and Tarr (1992) devote a chapter to exploring the sensitivity of results to alternative ways of modeling the labor market. They show that incorporating endogenous labor supply results in a reduction in labor supply of 0.003 percent when quotas are removed in autos steel and textiles. They also find that modeling wage-setting labor unions makes very little difference to their overall estimates (see table 6.8). They do however give measures of labor turnover across sectors along with the discounted benefits of trade liberalization taking into account survey-based estimates of the time it takes for displaced workers to find a new job.

Third, labor reallocation across sectors following a reduction in protection is small, for two additional reasons. First even for models with many sectors, non-traded sectors are largely unaffected by changes in trade policy. Second, for traded sectors, the Armington CES assumption of product differentiation at the national level gives a large (arguably unrealistic) degree of autonomy to the prices of domestic substitutes while at the same time gives rise to important terms-of-trade effects in multi-region models. For the labor market estimates, because the pass-through from a tariff reduction to the price of the domestic substitute is very small (usually less than 20% of the tariff reduction-see de Melo and Robinson, 1985), the demand for labor is barely affected by a tariff reduction.

The assumption of product differentiation at the national level also has implications for a comparison of the labor market effects of preferential vs. non-discriminatory reductions in protection. Since by construction goods are substitutes according to origin, an elimination of tariffs has spillover effects. This spillover effect has been observed in the data and estimated by Chang and Winters (2002) in the case of MERCOSUR over a large number of products. They estimate that the US lowered its price to MERCOSUR sales by 10 % following the implementation of MERCOSUR. For example an elimination of protection on autos among MERCOSUR partners will lead to an increase in the price of partners and a fall in the price of autos exported to the region by the rest-of-the-world. Thus partners gain at the expense of third-country suppliers who lower their price in the RTA markets. The spillover on third countries means less adjustment in the labor market (i.e. job displacement) and less adjustment in wages when trade liberalization takes place on a preferential rather than a non-preferential basis (see table 2).¹⁴

The assumption of product differentiation at the national level is also problematic because welfare results indicate large terms-of-trade effects that appear at odds with the evidence (see the high substitution elasticity estimates in Hertel et al. (2007)). Introducing a more flexible functional form is one alternative¹⁵. Another is introducing product differentiation at the firm level (i.e. Dixit-Stiglitz-

¹⁴ Chile adopted a strategy of negotiating 'additive regionalism' i.e. negotiating preferential trading arrangements with all potential Southern trading partners. Using a multi-region perfect competition model, Harrison, Rutherford and Tarr (2003) compare the welfare results for Chile of alternative preferential schemes ranging from non-discriminatory trade liberalization to various FTAs and CUs. The ranking of welfare effects across scenarios show the magnitude of trade diversion across scenarios when compared with unilateral trade liberalization. While Chile would lose from individual FTAs, the strategy of additive regionalism would lead to a welfare gain because of the combination of terms-of-trade gains in Southern partners markets and the reduction in trade diversion costs if Northern partners (US and EU) are included in the network of arrangements. They also argue that incorporating (plausible) dynamic effects through learning in a model with increasing returns to scale will lead to multiple gains from static effects with the same model, but that the ranking between different approaches to regionalism will not be overturned by incorporating these dynamic effects.

¹⁵ See the discussion of the Lewis and Robinson (2004) study in table 2. As a warning on the importance of assumptions about functional forms, Hertel (2012) recounts the contradictory welfare estimates across two models from an Australia-US FTA. The model with low substitution elasticities produced large terms-of-trade effects as exports had to expand to meet the balance of trade constraint, and hence a welfare loss for Australia. On the other hand, the model with high elasticities produced a welfare gain. Keck and Piermatini (2007) explore the sensitivity of estimated results to systematic variations in this key parameter showing that welfare estimates often change signs when the elasticity is varied by $\pm 50\%$. On the other hand, Hertel et al. (2007) carry out systematic exploration of the sensitivity of results to variations in their econometrically estimated elasticity of substitution between imports from different regions. They show that results on trade creation and trade diversion for a FTAA are not affected by variations within two standard deviations of their point estimates and conclude that CGE estimates are robust to systematic variations in this key parameter.

Krugman love of variety under symmetric Cournot competition) in which case the mark-up is determined by a single parameter. This requires data on the number of firms but is likely to present difficulties in calibration since the computed the mark-up may not generate zero profits as required by the Lerner conditions.¹⁶

Moving from differentiation at the firm level to accommodating different varieties would be desirable as it reflects the recent rise in trade in intermediates and the growing expansion of trade at the extensive rather than intensive margin. For large economies, about 60% of export expansion comes from new varieties (Hummels and Klenow, 2005). With new varieties, there is no reduction in price as in the case of product differentiation taking place at the national level where substitution takes place across existing varieties. New intermediates products have been shown to be a major source of welfare gains following tariff liberalization, but incorporating different varieties is especially demanding on the data since one would need to track imports to individual uses within the destination economy.¹⁷

In conclusion, results from CGE simulations provide a lot of sector detail that would be informative for someone interested in the labor market consequences of regional trade arrangements. Francois et al. (2011) present several indices of labor displacement that could be reported from simulation results, e.g. the percentage of the labor force that is displaced across sectors. Of interest on their own, these indices are rarely reported (estimates of labor displacement across the US during the NAFTA debate is an exception). These estimates of displacements which are measured in effective labor units do not take into account any loss in job-specific expertise. With information on the amount of wage increases that are associated with tenure in a job, these estimates could be part of a dynamic impact analysis of losing and gaining job-specific expertise (see e.g. the estimates by Topel (1991) for the US). Unfortunately, these measures of displacement are rarely reported, probably in great part because of the insensitivity of labor market results attributable to the characteristics of the models.

Devarajan and Robinson (2005) also note that CGE-based estimates were influential in the debate about worker displacement in the US and on the potential pressure on migration of Mexican reforms in agriculture at the time when barriers to agricultural trade between the US and Mexico would have effects on agricultural labor markets (for Mexican imports of US corn and for US imports of fruits and vegetables). Even though the final agreement provided for a fifteen year implementation of provisions regarding agriculture, the CGE estimates were useful to show some of the trade-offs as NAFTA was good for Iowa corn farmers and bad for Californian and Texas labor markets.

¹⁶ In their study of the auto industry under NAFTA, Hunter et al. (1992) get around the computation of negative profits in their calibration by introducing a conjecture parameter that they interpret as the extent of collusion in the auto sector. It is not clear that this fix actually reflects the behavior in the auto industry.

¹⁷ Goldberg, Khandelwal, Pavnick and Topalova (2009, 2010) show that 65% of the increase in Indian imports following trade liberalization was for new HS products with 82% coming from new varieties, the new varieties being concentrated on intermediate inputs with 70 percent coming from OECD countries. They estimate that the new varieties generated an additional 4.7 percent decline in the imported input index and that firms developed new products.

3.2. A Sample of CGE Estimates

We now report a few estimates of labor market effects generated by CGE models measuring the effects of RTAs. Because CGEs occupied center stage during the discussions about NAFTA, we report on these separately before giving in table 2 estimates from a few CGEs with distinctive assumptions either about the treatment of labor markets in the model (formal and informal markets, fixed wages) or about the extent of trade liberalization envisaged (e.g. the inclusion of barriers in services).

At the time of NAFTA negotiations, preoccupations in the US were about identifying gainers and losers: for US labor unions it was job losses to Mexico and lower wages (Ross Perot's 'giant sucking sound'). It was also about which sectors might be most affected on both side of the US-Mexico border (Canadian trade with Mexico was recognized to be mostly affected by CUSFTA). As noted by Devarajan and Robinson (2005), CGEs were in the limelight during the debate in all three countries. Rather than reporting estimates, here are the main lessons from a comparison of the different models reported in the volume edited by Francois and Shiells (2004) and also summarized by Devarajan and Robinson (2005). First, all models whether in a single or multi-country context conclude that NAFTA was net trade creating and would benefit all three countries. Second, NAFTA was expected to have very small/negligible effects on Canada and especially on the US economy while large positive effects were predicted for the Mexican economy (2-5% increase in GDP). Third, non-tariff barriers were potentially as important as tariff barriers. Fourth, models incorporating some form of imperfect competition predicted larger gains¹⁸. Fifth, incorporating (exogenously) international capital mobility attributed to NAFTA was more important than trade liberalization.

¹⁸ These models with imperfect competition were inspired by the ground-breaking work of Harris (1984) and Cox and Harris (1986) on CUSFTA where they showed that Canada would reap substantial gains from the agreement if Canadian firms were obliged to adopt a more competitive pricing strategy. Similar results were also predicted by de Melo and Tarr (1992) when they compared the costs of tariff and non-tariff barriers in autos, textiles and steel for the US economy under different assumptions about market structure for autos and steel.

Table 2: Representative CGE Labor Market Estimates of Elimination of Protection

Authors/Study	Model Structure	Factor Markets/●Experiments	Macro closure	Main Results
Flores (1997): MERCOSUR (Argentina, Brazil, Uruguay)	MR-GE(7); Sectors=5+4; R=7. Armington : Monopolistic competition	Labor and capital: full employment. Factors mobile across MERCOSUR countries. ●Removal of tariffs on MERCOSUR trade under different assumptions about the CET	Government redistributes tax revenue	^a Real wage changes Argentina [+1.5%+2.6%] Brazil [+3.1%+3.9%] Uruguay [+3.4%+3.5%]
Decaluwe, Dissou, Robichaud (2004) UEMOA (Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, Togo)	MR-GE CRTS; Armington	Capital; Formal and informal labor; total labor supply fixed. Labor mobility w/n countries; Minimum wage in formal sector. Unemployed in formal seek work in informal sector, driving down the wage down in the informal sector. ●Removal of tariffs on UEMOA trade and application of a CET	Savings driven. Downward wage rigidity of formal workers in terms of numéraire (the exchange rate)	^b Formal wage, informal wage in parenthesis under flexible wage closure followed by unemployment of formal labor and informal wage change in brackets when nominal wage is fixed in the formal sector. Burkina Faso (-7.3%;-5.4%) [+5.5%;- 9.1%] Ivory Coast (20.3%;5.9%)[0;5.9%] Senegal (-3.9%;-3.6%); [+4.4%;-13.1%]
Lewis and Robinson (2004). Estimates of EU-SADC FTA for 7 individual SADC members and 5 other regions	MR-CGE based on GTAP5 data base. CRTS; AIDS system for aggregating imports. CET for exports; 17 sectors	Capital, skilled and unskilled labor; land and natural resources. Factors of production do not move across countries. ● EU-SACU FTA + SADC-FTA	Aggregate consumption and investment fixed. Wage of unskilled labor fixed in terms of the numéraire	^c Range of percentage increases in unskilled employment in brackets SAF [3.5-4.%] Botswana [11-14%] Zambia [2-4%]
Balistreri and Tarr (2011)	MR-GE: 3 regions, 55 sectors; CRTS+ IRTS sectors Dixit-Stiglitz for services	Skilled, semi-skilled, unskilled labor; land; mobile and immobile capital	Full-employment across skills; flexible wages and prices;	^d Factor adjustments (Percentage changes) Skilled (0.5;0.7;2.1) Semi-skilled (0.7;0.8;2.1) Unskilled (0.2;0.0;1.3)

Notes: Model Structure MR-GE= Multi-region GE model; PE=Partial equilibrium; CRTS= Perfect competition across all sectors; Sectors= Number of perfectly competitive sectors followed by number of imperfectly competitive sectors.

Macro closure: All models assume that the balance of trade is exogenous ('no free lunch) so the real exchange rate is endogenous. Year of calibration in parenthesis.

Explanatory notes: Unless otherwise noted, all results refer to percentage changes from elimination of tariffs within the agreement.

^a Range refers to the three scenarios considered with respect to the level chosen for the CET (weighted average of members tariffs; highest member tariff; lower tariffs by EU and NAFTA) For the non-competitive sectors, close to two thirds of the welfare gains comes from the reduction in price-cost margins(table 3).

^b Removal of tariffs among the seven members (Benin, Burkina Faso, Ivory Coast, Mali, Niger, Senegal) and selection of a common external tariff. A uniform domestic tax is levied so as to maintain fixed the receipts from domestic taxes. Only results for three countries are reported. See tables 6 and 7 for results for other countries. Note that the fixed wage in the formal sector is not binding in Ivory Coast (zero unemployment in brackets).

^c Trade creation dominates trade diversion for the region under all FTA arrangements, though some SADC countries are slightly hurt by an FTA between the EU and SACU (the spillover effect). An FTA with the EU and all SADC countries dominates all other arrangements. Range of increases in unskilled employment depends on the FTA

^d Figures in parenthesis refer to percentage changes for liberalization for:(EU-FTA followed by Africa_FTA and by Unilateral)

With all models drawing on the same data, given the commonality in behavioral assumptions and elasticity specifications, it should not come as a surprise that results across models were in close agreement. As to differences in magnitudes across models, Kehoe and Kehoe (1994) compare results from multi-country models with those from single country models and report the following ranges: in a multi-country model, Brown, Deardorff and Stern (1992) estimate around 0.5% change in wages from NAFTA across all countries, but a change of 7.2% in Mexican wages if inward Mexican FDI increased by 10% along with an increase in GDP of 5.4% (instead of 2.2%). In a single-country model for Mexico inspired from Harris (1984), Sobazo (1994) estimates an increase in GDP of 3.7% under full-employment but of 4.9% increase when the real wage is fixed in which case, the model predicts an increase in employment of 5.1%.

Moving beyond NAFTA, table 2 gives a flavor of the variety of ex-ante CGE estimates carried out for RTAs for which authors' report labor market effects (either wages, employment or displacement across sectors). Flores (1997) is interested in the efficiency effects of eliminating tariffs on intra-Mercosur trade under different assumptions about the Common External Tariff (CET) and about the EU and US multilateral tariff reductions. As in many estimates, a key feature of the study is the mixture of sectors operating under constant returns to scale with sectors operating under economies of scale and imperfect competition (usually monopolistic competition). Since the selection of sectors with increasing returns to scale is somewhat arbitrary, general equilibrium results will be sensitive to this choice and to the extent of calibrated scale economies.¹⁹ Flores assumes that labor is fully employed and could move across the three countries. His estimates show an increase in the real wage in the 3%-5% range across countries, but little sensitivity (not reported here) of equilibrium wage changes across the different scenarios.

Decaluwé et al. (2004) estimate the effects of removing tariffs among UEMOA members while adopting at the same time a CET against non-members. To reflect the pervasive dualism in low-income countries, they model a formal and an informal labor market in each country. They contrast results from UEMOA implementation under two model closures in the labor market, one in which wages clear both labor markets, and one in which the formal workers' wage is fixed (i.e. rigid downward). This rigidity intends to capture the effects of government laws or the negotiation power of unions. If rationed in the formal labor market, workers move to the informal market exerting downward pressure on the wage and a wedge that reduces the gains from implementing the customs union. Under the dual labor market specification, it turns out that the fixed wage is binding in three out of the seven countries, resulting in an excess supply of labor that spills over to the informal labor market, driving down the wage in the informal labor market. For example, in the case of Senegal when there is a floor on the formal wages, there is an excess supply of 4.4% in the formal sector which drives down the wage in the informal sector by 13.1% (instead of 3.6%).

¹⁹ If, on balance, the more highly protected sectors operate under constant returns to scale, then there will be extra gains from releasing resources to sectors with increasing returns. However, as argued by Katayama and Tybout (2003), the extent of unexploited returns to scale calibrated in the models is greater than suggested by the econometric evidence from plant data.

Lewis and Robinson (2004) is a typical application of GTAP with substantial country, sector and factor market detail along with some notable modifications to the standard GTAP structure.²⁰ They abandon the CES specification for import demand and use a flexible functional form (the AIDS demand system) which allows imported varieties from different regions to be good substitutes for one another and hence dampen terms of trade effects. They also treat exports symmetrically to imports (CET functions) to prevent export prices from being too sensitive to foreign demand so that they avoid unrealistically large terms-of-trade effects from trade liberalization. On the labor market side, they reflect unemployment in South Africa and in the SADC countries by assuming that when sectors expand they can attract unskilled workers who were not in the labor market at a fixed wage (all factor markets are assumed to clear in other regions). They also assume that output in the mining sector is fixed in mining in South Africa. Results in table 2 show a rather large range of change in unskilled labor employment estimates across countries from 2% to 14%.

Finally, Balistreri and Tarr (2011) is the first ex-ante study that assesses the welfare and employment reallocation effects of preferential reductions in barriers on goods and services trade. Their results are supplemented by estimates of reductions in barriers against foreign direct investment in services sectors. The application is for Kenya which can choose different paths to reducing barriers to services: liberalize preferentially with African partners (SADC or the EAC); with the EU (under EPAs); with both, or; unilaterally. Services are provided either by MNEs with a presence in Kenya or by cross-border trade (at constant costs but are poor substitutes for providers with a domestic presence). MNEs face barriers to FDI. When barriers are removed, foreign firms enter, increasing the number of varieties in production which in turn reduces production costs (i.e. increases productivity). Increased product variety has been found to be important in estimating the effects of trade liberalization.²¹

The summary of results for welfare, wages and labor turnover by category are summarized in table 2 under the assumption that the rents associated with the barriers to entry in services are initially captured by foreigners (if captured by Kenyans, welfare gain estimates are drastically lower). Gains are mostly from liberalization in Services rather than liberalization in goods and, as expected given the assumptions about the elasticity of varieties to a reduction in price, the gains are largest under

²⁰ Hertel (2012) gives a retrospective of some of the most influential trade reform applications using the GTAP model and database. While many concerned the Uruguay and Doha Rounds, others concerned estimates of a score of FTAs, or the dynamic gains from deep regional integration (i.e. the benefits to newcomers of EU enlargement (Baldwin et al. 1997)). CGE models of FTAs of the EU with Southern Mediterranean neighbors are not reviewed here. In general, these models incorporate imperfect competition in the Southern partners' markets so that the resulting FTAs are beneficial because the reduction of protection brings gains from increased competition in their markets (see e.g. Rutherford, Ruström and Tarr (1993) for Morocco or Baldwin et al (1999) on the single market programme). While plausible, all these estimates do not take into account the extra cost associated with restrictive rules-of-origin applied by the EU in all its PTAs which could dampen or overturn the benefits from preferential access (see the evidence on the extent of restrictiveness of rules-of-origin of the EU and US in Cadot and de Melo, 2007).

²¹ Broda and Weinstein (2006) estimate that increased product variety contributes to a 1.2 percent decrease in the true import price index. Differences in elasticities of varieties to price changes capture the ease with which total factor productivity can increase through a transmission of new technologies. Balistreri and Tarr vary this elasticity across regions and across sectors (for Kenya the elasticities are low for African varieties (2 to 4), but higher for the EU (3 to 10) and higher still for the ROW (10 to 20)). Under this parameter selection, preferential trade liberalization with Africa brings few varieties and hence small gains in productivity while the gains are highest for liberalization with the ROW.

unilateral liberalization followed by an FTA with the EU and an FTA within the Africa region.²² Of interest here, are the results for the three categories of labor: unskilled, semi-skilled and skilled. As shown in spite of a rather large range of welfare results across alternatives, the effect on wages (and hence labor displacement or reallocation across sectors) can be considered as small to modest. Except in the case of domestic reforms combined with unilateral trade liberalization (UNIL+DOM), wage gains are less than 5 percent with correspondingly low reallocation of labor across sectors.

3.3. How Informative are CGE Estimates?

The different approaches to modeling the labor market- in CGE models generally suggest that the wage and displacement effects of FTAs should be small once general equilibrium effects are factored in. The small labor-displacement estimates, when they are reported, are in conformity with ex-post observations showing rather small changes in sectoral outputs as would be predicted by models of intra-industry trade. When incorporating wage rigidity in unskilled labor markets, predicted adjustments in the labor markets are larger, with unemployment estimates for unskilled labor in the 5-10 percent range. The question then is whether this assumption is justified, and if so, whether it is capturing other effects such as skill mismatches or search costs (see the discussion by Ornelas (2012) not included in the model). This last remark raises the question of how informative CGE estimates are.

Two preliminary remarks First CGE are meant to isolate the effects of mechanisms guided by accepted theories, not to be checked against history, especially in an area as complex as RTAs where 'deep integration' measures are also at play, measures that are increasingly more important in the final outcome than reductions in trade barriers in goods which are now quite low. There are also other confounding factors as shown in the competing explanations of the evolution of the wage skill premium in Mexico under NAFTA (see below). Second, as some authors have argued, CGE model validation should be restricted to checking the values of econometrically estimated elasticities which is increasingly done by Monte-Carlo simulations for key parameters that then generate confidence intervals for the estimates, as done for instance by Hertel et al. (2007).²³

This said, validity can be assessed by comparing results with those obtained from ex-post estimates in which, via alternative econometric techniques, one tries to identify the outcomes of the RTAs. Two approaches have been privileged. The first is the use of the gravity model to detect trade creation and trade diversion effects. The second is the application of econometric techniques where the identification of the RTA relies on measuring the effects of differential tariff changes

²² The much larger gains from non-discriminatory liberalization come from the combination of a larger share of goods coming from the ROW combined with the assumption of a high elasticity of variety for goods from the ROW.

²³ Historical simulation as discussed by Dixon and Rimmer (2012) whereby modelers adjust various shift parameters is of little interest in the context of evaluating RTAs. For example, RoO could be included in the models, but that would imply modeling these requirements directly. This could be done (see e.g. Cadot et al. (2005)) but it requires a considerable detail on the specifics of these RoO that vary across products.

across sectors (tariff changes that can be assumed to be exogenous in the case of FTAs) on employment, wages or other outcome variables after controlling as best possible for other intervening factors. This approach is discussed in the following sections. Among these, a favorite is the gravity model whose estimates on trade flows do not always confirm the quasi universal net trade creation of RTAs predicted by CGEs (see e.g. Devarajan and Robinson (2005) and Hertel et al (2007) mentioned above).

Using a gravity model on panel data for 130 countries covering the period 1962-1996 with country-pair fixed effects, introducing the correct number of dummy variables to capture trade diversion and trade creation effects and controlling for the endogeneity of some the variables, Carrère (2006) isolates the average effects of RTAs on bilateral flows. She concludes that subsequent to implementation, RTAs have usually generated a significant increase in trade among members, but often at the expense of the rest-of-the-world, suggesting trade-diversion²⁴. Also using a panel gravity model for 133 countries over the period 1980-1998, Magee (2008) finds that trade grew faster among countries with an RTA than among countries that had none. Including country-pair fixed effects reduces the estimates of the RTA effect on intra-bloc trade, though these still remain significantly positive while, in most cases, RTAs do not reduce extra-bloc trade. He also finds the cumulative increase in trade is greatest for CUs followed by FTAs and by PTAs. One of the reasons for this general lack of trade diversion effects in this large sample is probably due to the deepness of the new RTAs. In the new RTAs post-1980 many provisions measures (e.g. reduction of barriers to trade in services or a move towards regulatory harmonization) are non-discriminatory and—as noted in the introduction— can lead to an all-around increase in trade.

Romalis (2007) studies the effects of NAFTA on trade by estimating trade volume and price effects generated by the removal of tariffs for intra-bloc trade under NAFTA. Drawing on the large dispersion and relatively high level of tariffs in Mexico and Canada prior to the implementation of CUSTA and NAFTA, he estimates supply elasticities (in the range of 0.2 to 5) and substitution elasticities (in the range of 6 to 10) across partners at the HS6-level (over 5000 commodities) for both countries. His estimates indicate that a 1% reduction in intra-North American tariffs causes a 2.8% to 3.9% percent decline in exports from third countries to North-America. These are exactly the effects that operate in the CGE models where, by construction imports from different origins are substitutes. However, when he estimates welfare effects, he obtains a welfare loss for Mexico of 0.3% (and virtually no change for Canada and the US), a result in rather sharp contrast with the ex-ante CGEs predictions for Mexico discussed earlier (+2-5% range). Much finer commodity disaggregation will necessarily raise the variance of tariffs and hence the welfare costs of discriminating across suppliers mitigating the positive effects obtained from the more aggregated CGE models. To progress, one must go into greater detail about the particulars of each RTA under review and dig deeper into adjustments across households and firms. We turn to this in the next sections.

²⁴ Her figures 1-3 show the evolution of the dummies over the period for the EU, NAFTA and MERCOSUR. The evolution of the patterns suggests trade diversion for NAFTA and MERCOSUR. Using detailed tariff data, Yeats (1997) also concludes that trade diversion effects were probably important in the case of MERCOSUR.

4. Ex-Post: Detecting labor market outcomes

The rise in income inequality among developing countries is a robust observation during the current period of globalization. It has come as a surprise since it was predicted that the worldwide reduction in protection whether on a non-preferential or a preferential basis should have led to a closing of the skilled-unskilled wage gap in developing countries (and a widening in developed countries). Data show that wages and employment have moved in the same direction across skill categories, suggesting that demand shifts have dominated the observed changes in wages and the increase in the wage premium. Drawing on the varied experience of seven developing countries that globalized since the middle 1980s, Goldberg and Pavcnik (2007) suggest several explanations for the increase in the skill premium, all of which are often at odds with some of the assumptions in the ex-ante CGEs reviewed above. First, they note that the absence of Stolper-Samuelson effects might reflect the fact that most reallocation to reforms took place within rather than across industries, perhaps because of rigid labor markets or just a lack of labor mobility for other reasons (e.g. low social and spatial mobility). One could add that CGE models predict small changes in factor rewards. It could also reflect an upgrade in product quality and firms' productivity for which we give evidence in section 5. Second, trade liberalization coupled with the removal of capital controls could result in outsourcing on the part of cost-minimizing firms, the result being an increase in the average skill-intensity in both developed and developing countries (as evidenced by the rising share of maquiladoras under NAFTA discussed further below). Third, if capital and skilled labor are complementary, an increase in capital flows would lead to higher demand for skilled labor. Fourth, the general increase in the share of skilled workers and in their wages observed within narrowly defined industries suggests some skilled-biased technical change. It could also be that the reforms increased the demand for managers and professionals that could implement the reforms. This long list suggests that much is going on at a disaggregated product or firm level to which we return in section 5.

Another difficulty underlined by Goldberg and Pavcnik that applies to the evaluation of the impact of regional trade agreements on the labor market is that many policy changes and shocks were occurring simultaneously in all countries (see their description of the concurrent shocks) so that policies and mechanisms were country-time and case-specific. As examples take Argentina and Mexico. Contrary to expectations, Mexico was in fact protecting unskilled-intensive activities. In the case of Argentina, Galiani and Sanguinetti (2003) estimate that the skill premium for college students rose by 10 percentage points per year during the 1990s, the period that coincided with the period of trade liberalization and implementation of MERCOSUR. However, they find that the identifiable change in the skilled premium due to trade liberalization is small, i.e. it accounted for 8 percentage points increase between 1992 and 1999 which is only 15% of the increase in the skill premium during the period.

Goldberg and Pavcnik argue that strong modeling and identification assumptions are needed if one hopes to measure the overall effect of trade liberalization on the labor market and on

inequality in a country.²⁵ Here we illustrate these difficulties by contrasting two approaches: examination of the confounding factors on wages and the labor market in Mexico under NAFTA and econometric estimates of the response of household to changes in tariffs in MERCOSUR and NAFTA.

4.1. Confounding factors and the NAFTA wage puzzle

The Southern side of NAFTA (Mexico-US) presented great hopes for what a North-South trade agreement focusing on market access in goods trade and in the movement of capital might achieve for the Southern partner. Within a ten-year period starting in early 1994, the Mexican tariff would go down from 12% to 0%, other barriers to trade would be eliminated while on the US side the tariff would go down from 2% to zero.²⁶ NAFTA entered into force in January 1994 in the wake of a deep unilateral trade liberalization by Mexico starting in 1986 following GATT membership. During 1986-1993, average protection fell from 24% to 12%. The FTA agreement also improved substantially the standing of foreign investors (MFN, NT, absence of trade-related performance requirements plus the freedom to buy foreign exchange and to transfer funds across countries). However, as discussed in section 2, very little liberalization took place on the temporary movement of labor (mode 4 in the GATS negotiations) as only limited mobility of professional workers was allowed.

Assessment of the labor market effects of NAFTA is complicated by two (largely exogenous) events that occurred the same year (see below), other changes in the structure of the labor force, and the role of rules of origin that are necessary to prevent trade deflection in any preferential agreement. First, the 1994 peso crisis led to a real depreciation of the peso of close to 40 percent in 1995 (Verhoogen, 2008, figure III) and a fall in GDP of 6.2% from 1994 to 1995. Second, the tightening of border controls against illegal immigrants on the US side coincided with NAFTA. In addition, there was an important change in the labor market around the time of NAFTA as the relative supply of skilled workers rose sharply while demand stagnated. Finally, rules of origin were quite restrictive.

Figure 2 gives an evolution of several indicators of the labor market before and during NAFTA. Figures 2(a) and 2(b) report two measures of the skill premium. Figure 2(a) displays the within-industry ratio of skilled-unskilled wages (the employment-weighted average of non-production (empleados) and production (obreros) wages). It shows that once the recovery from the peso crisis was under way, the relative wage of skilled workers falls. Figure 2(b) conveys the same information on the employment side but with a much finer disaggregation of workers into 17 employment categories.

²⁵ See Table 1 in Golberg and Pavcnik (2007) where they describe the other policy reforms that occurred simultaneously with trade liberalization across their group of seven countries (Argentina, Brazil, Colombia, Chile, India, Mexico, Hong-Kong).

²⁶ Reductions in other barriers to trade were less important. Thus some tariff-quotas would remain for agriculture and restrictive rules of origin would hamper trade expansion while anti-dumping and countervailing duties would continue to be applied by the partners according to their own trade laws.

If trade and/or foreign investment are a substitute for migration as suggested by the standard analysis (Mundell, 1957), then one would expect that more trade induced by a reduction in tariffs would increase Mexican wages as would foreign investment, thereby reducing the incentive to migrate. On the other hand stricter border enforcement would deter migration and hence decrease real wages. Robertson (2005) combines trade, investment and US border enforcement data into a single estimation equation of the Mexican real wage over the 1992–2002 period. He finds that trade increased the Mexican relative real wage by about 3.6 per cent, but that the increase in US border enforcement over the same period reduced the Mexican relative real wage by about 4.4 per cent so that the effects of enforcement were sufficient to mitigate the otherwise positive effects of increasing trade on absolute wages.

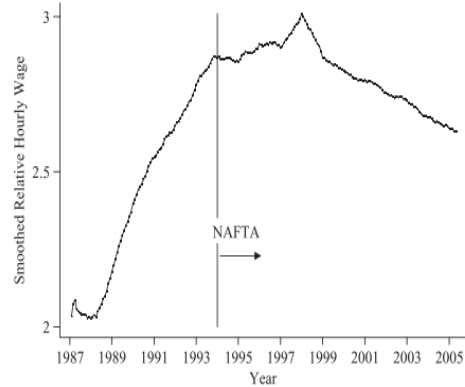
Robertson also explored the wage gap and the rate of convergence in wages between the US and Mexico over the period 1987-2002 using quarterly data to see if there was any change in convergence during NAFTA. His estimates are for 40 similar groups (8 age groupings and 5 educational levels) in the US and Mexican population. This disaggregated approach allows him to control for changes in demographic characteristics that would otherwise affect average wages. He finds that the wage gap falls over time, that it is about the same in 1999 as it was in 1989, and that the rate of convergence is not significantly higher during NAFTA.

The sharp change in direction of the wage gap (figure 2(a)) while Mexico was following the same path of liberalization under NAFTA as it had previously, raises the question of the possibility of a change in Mexican manufacturing from one in which US and Mexican workers were substitutes (ante NAFTA) to one where they became complements (post NAFTA). As shown by Feenstra and Hanson (1997) in their celebrated model of vertical integration (or outsourcing), when they open to trade, countries specialize in producing different stages of the same good. According to their model, the relocation of the production between a developed and a developing country after a trade liberalization should first increase the demand for skilled labor and hence the skill premium in the both countries²⁷. However, Navaretti and Venables (2004) show that, once the investment takes place, the labor in both countries become complementary throughout the stages of the same production process.

²⁷ When they turn to study the effect on employment and wages for skilled and low skilled labor of the trade and foreign investment regulation reforms before NAFTA (over the period 1975-1988), Feenstra and Hanson found, consistently with their model, that a higher level of *maquiladora* activity in a Mexican industry within a state led to a higher share of total wages' going to skilled workers.

Figure 2: Wages and employment in Mexico under NAFTA

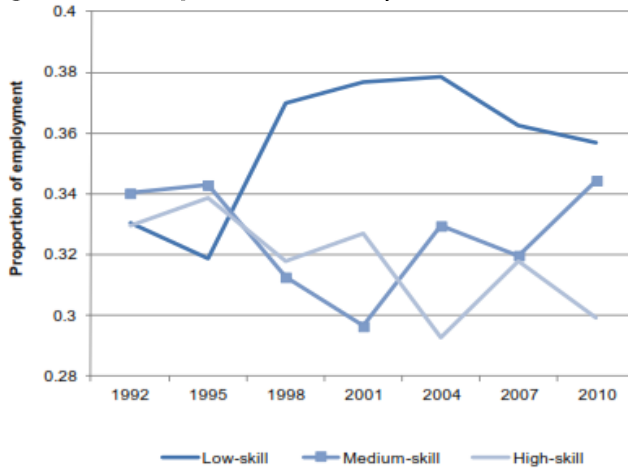
Figure 2a.: Relative Wages Before and After NAFTA



Note: The relative wage is the average hourly wage of non-production workers divided by the average hourly wage of production workers, so that an increase (decrease) in the series is a rise (fall) in wage inequality.

Source: Robertson (2007)

Figure 2.b: Occupational shares by skill level



Source: Campos and Rodriguez (2011). Data on average employment shares across 17 labor categories ranked by education level and aggregated into terciles ranked by education level in 1992.

Figure 2c: Relative Prices and Relative Wages



Note: The relative goods price represents the relative price of skill intensive goods and the relative wage represents the relative wage of skilled workers.

Source: Robertson (2007)

Harrison and Mac Millan (2011) studied the impact on U.S. manufacturing employment of changes in foreign affiliate wages. They find support for this complementarity between US parents and affiliates employees in low-income countries, in particular for Mexican affiliates. Their results show that a 1 percentage point decline in low-income affiliate wages is associated with increases in U.S. parent employment of between 0.09% and 0.8%. They use this result to argue that offshoring is not the primary driver of declining domestic employment of US manufacturing multinationals between 1982 and 1999. This complementarity between Mexican and US workers also suggests that a decline of the skill premium in Mexico helps absorb the supply of workers in the US. As pointed out by Robertson (2008), Mexico and the U.S. might then be better characterized as production partners than production competitors, this outsourcing shift observed world-wide being accelerated by the investment provisions in NAFTA that boosted FDI towards Mexico.

Robertson (2008) finds further support for this shift from substitutes under the GATT period to complements under NAFTA by estimating labor demand equations for US production workers, Mexican production workers, and Mexican non-production workers for both Maquila and non-Maquila manufacturing. He confirms that production workers in the Maquila sector are complements with workers in US manufacturing as suggested by a situation in which both are part of the same production chain. When he applies the same analysis to the non-maquila manufacturing for the GATT period (1986-1994) and for the NAFTA period, he finds that US and Mexican workers are substitutes during the GATT period (as suggested by a Heckscher-Ohlin model). However, during the NAFTA period, he finds the opposite, suggesting that non-maquila manufacturing is moving towards integration into the North-American chain under NAFTA (i.e. Mexican and US workers are becoming complements). He also gives evidence that the relative-price of skill-intensive activities were falling during the NAFTA period along with the relative wage of skilled workers (see figure 2(c)) which one would expect from the Heckscher-Ohlin model since maquila are less skill-intensive than non-maquila manufacturing. Similarly, Waldkirch (2010) studies the impact of FDI on wages in Mexico over the 1994-2006 period finding that maquila FDI affects negatively the wages of skilled labor.

Campos- Vázquez (2010) questioned the representativeness of the manufacturing data used to explain the decrease in wage inequality by trade or skill-biased technical change, as manufacturing only accounts for 20 percent of total workers. Using wage data from expenditure surveys which are more representative over the period 1989-2006, he shows that there were substantial increases in college enrollment after NAFTA which was not met by an increase in demand for the highly educated workers. Since institutional factors such as unionization did not change during this period, he concludes that it was changes in relative supply that drove the decrease in wage inequality.²⁸

²⁸ Comparing the evolution of changes at the top and the bottom of the wage distribution, Campos-Vazquez also shows some "job polarization" in Mexico during NAFTA. The demand for occupations in the middle of the wage distribution (e.g secretaries) that are substitutes for computers declined while the demand for low-paid jobs like construction workers increased. This is apparent in his figure 11.

Finally, rules of origin can dampen substantially the reallocation of resources expected from a preferential trade agreement. Since the political-economy of setting rules of origin results in these being stricter for products with higher preferential margins, they contribute towards explaining why ex-post PTAs are accompanied by minor resource shifts across sectors. Under NAFTA origin requirements were very strict, notably for textiles and apparel (T&A) where qualifying for the preference margin of 11% in T&A required Mexican producers to produce T&A with yarn being woven into fabric, and the fabric being cut and made-up into clothing, all inputs coming from NAFTA partners. Using HS6 level data on Mexican exports to the US for 1999 and 2001, Carrère and de Melo (2006) show that, after controlling for preference margins, utilization of preferences were lower for sectors with more restrictive rules of origin. Drawing on HS8-level data for Mexican exports of T&A to the US, Cadot et al (2005) estimate that one third of the higher price for sale under NAFTA to the US goes to compensate for higher intermediate costs associated with purchasing US yarn and fabrics. Again drawing on disaggregated HS-8 level data, they estimate that market power conferred by NAFTA allowed US suppliers of intermediate goods to raise the price of sales to Mexican producers by 12 percent relative to sales to other countries.

4.2. Household-based estimates

Recent availability of multiple household surveys makes it possible to estimate econometrically the effects of tariff reforms on wages. The method, first developed by Porto (2006) starts from the income-expenditure identity imposed by the economy's budget constraint and derives demand and supply functions from maximizing behavior. This gives general equilibrium demand and supply functions that are then fed into a household indirect utility function. As under the CGE approach, welfare assessments are based on average compensation variations, except that this time these are carried out over the entire distribution of income across households. A change in tariffs is transmitted to changes in prices faced by households and in household factor rewards. The change in utility du_h for household h is given by:

$$du_h = \sum_s \theta_s dR_s - \sum_s \theta_{hg}^c dp_g$$

where dR_s is the income change of a household member with skill level of s , dp_g is the change in price of good g in percentage terms, θ_s and θ_{hg}^c correspond respectively to the share of member s in household income and the share of income spent on good g by household h .

The welfare effect is then computed in two steps. First, estimates are carried out of how exogenous changes in trade policies affect directly household income via the change in the prices they face and indirectly by changes in wages and other revenues induced by the changes in prices. In a second step, welfare effects of tariff changes are computed based on household data on consumption shares and sources of revenue. As in the CGE models, the welfare impact includes two effects: a consumption effect, i.e. the welfare impact caused by changes in the price of the

consumption basket, and an income effect, i.e. the welfare impact resulting from changes in wages and revenues.

Table 3 reports the results of four studies using this method to evaluate the effect of regional trade agreements on household's welfare and real income for countries engaged in RTAs and examined elsewhere in this paper. Thanks to the availability of representative household surveys in many Latin American countries, three these studies focus on the effects of MERCOSUR on household welfare (in Argentina, Brazil, Uruguay and Paraguay (Porto, 2006; Borraz et al, 2011 and 2012)). The last (Nicita, 2009) traces the effect of the reduction in tariffs in Mexico from 1990 to 2000 (including NAFTA) on Mexican household incomes.

While similar in approach, each study has specificities that are useful to keep in mind when interpreting results. For example, as in the CGEs, Porto distinguishes between traded goods (Food and Beverages, Clothing, House Equipment and Other Goods) and goods that are assumed to be non-traded (Housing, transport and communication, Health and Education and Leisure goods). By assuming a complete pass-through from tariffs to traded goods (in CGEs the extent of pass-through for traded goods depends on the values of the Armington elasticities), Porto computes the variation of prices of traded goods following the elimination of tariffs under MERCOSUR. He then estimates the response of non-traded goods prices to the exogenous change in traded good prices which are the basis for estimating the household consumption response to the tariff reduction once he has obtained the wage-price elasticities across labor categories.

Nicita (2009) follows the same general approach but relaxes the strong assumption of a complete pass-through from tariffs to domestic prices by estimating the effect of tariffs on local consumption prices of manufacturing and agricultural goods. As can be seen in the last column of table 3, the pass-through estimates are generally low, i.e. around 35 percent which is a larger estimate than the change in domestic prices generated by a change in tariffs in the CGE models assuming product differentiation at the national level.

Table 3 General-equilibrium household-based estimates of Tariff Liberalization

Authors/Study	Characteristics/specificity	Results ^a
Porto (2006) MERCOSUR Argentina	<ul style="list-style-type: none"> • <u>3 categories of labor</u>: Unskilled (Primary education); middle skilled (Secondary) and skilled (College) • <u>4 Traded goods</u> (Food and Beverage, Clothing, House equipment and other goods) • <u>3 Non traded goods</u> (Housing, trans.& comm., Health & Education, and Leisure goods) • Assume complete pass-through from tariffs to prices of traded goods. 	<p>^bTotal Welfare Effect: [rich: 0%; middle-income: +3%; poor:+ 6%].</p> <p><u>Consumption effect</u>:</p> <p><i>Traded goods</i>: [poor:-0.5%, rich: +0.75%];</p> <p><i>Non-traded goods</i>: [poor: +0.3%; rich: +1%].</p> <p><u>Labor income effect</u>: [poor: +7%; rich: -5%]</p> <p>Increase of unskilled/ skilled worker's wages.</p>
Nicita (2009) Tariff liberalization and NAFTA Mexico	<ul style="list-style-type: none"> • <u>Two types of goods</u>: Agricultural and Manufacturing goods. (no distinction between traded/non-traded) • <u>2 categories of workers</u>: Unskilled and skilled • Introduce an income for farm production (agricultural income) in addition to labor earnings. • Relax the full pass-through assumption from tariffs to prices: estimates the link between tariffs and consumption prices of traded goods. • Evaluate effect across geographic area in Mexico (difference in pass-through and consumption share). 	<p>^cTotal Welfare Effect: National: +1.8%. Across geographic areas: South :+0.9%; Center:+1.8%; North:+2%; Border: +3%.^b</p> <p><u>Average tariff pass-through</u>: Agriculture (33%) manufacturing (27%)^c.</p> <p><u>Consumption price effect</u>: National: +1.6%. Across geographic areas: South: +1%; Center: +1.5%; North: +1.8%; Border: +2.4%. High level of auto-consumption (40%) in the South: lower gain.</p> <p><u>Labor income effect</u>: National: +0.3%. Across geographic areas: South: +0.1%; Center: +0.4 %; North: +0.3%; Border: +0.7%. Increase of skilled/ unskilled worker's wages.</p> <p><u>Agricultural income</u>: National: -0.1%. Across geographic areas: Border: -0.2%; Center, North and Border: -0.1%</p>
Borraz , Ferrés and Rossi (2012) MERCOSUR Brazil	<ul style="list-style-type: none"> • <u>3 categories of labor</u>: Unskilled; middle skilled and skilled • <u>4 traded goods</u> (Food and Beverages, Clothing and Footwear, house equipment and electronics, other traded goods). • <u>4 non traded goods</u> (health and education, transport and communications, housing and other) 	<p>^bTotal Welfare Effect:</p> <p>Brazil [poor: +1%; rich: +1.6%]. Uruguay [poor: +4.8%; rich:+5.5%], Paraguay [poor: -5%; rich:-25%]</p> <p><u>Consumption price effect</u>:</p> <p><u>Traded goods</u>:</p> <p>Brazil [poor:-0.5%; rich: +0.75%]; Uruguay [poor:0.2%; rich: +1.3%]; Paraguay [poor:+2%; rich: +0.8%]</p> <p><u>Non traded</u>:</p> <p>Brazil [poor:+0.3%; rich: +1%]; Uruguay [poor:+4.3%; rich: +5.7%]; Paraguay [poor:+1%, rich: +2.8%]</p> <p><u>Labor income effect</u>:</p> <p>Brazil [poor :-5%; rich: + 7%]; Uruguay around -1.08%; Paraguay [poor :-10%; rich: -30%]</p>
F. Borraz, M. Rossi and D. Ferrés (2011) MERCOSUR Uruguay Paraguay	<ul style="list-style-type: none"> • Relax the full pass-through assumption from tariffs to prices. • Compute changes on poverty indexes and of values of inequality index (Gini). 	<p><u>Labor income effect</u>:</p> <p>Brazil [poor :-5%; rich: + 7%]; Uruguay around -1.08%; Paraguay [poor :-10%; rich: -30%]</p>

Notes: ^a Percentage welfare changes are in terms of real income with respect to the situation prior to tariff liberalization. A positive (negative) consumption effect indicates an increase (decrease) in purchasing power (induced by price variations following the liberalization). Similarly, the labor income effect is the percentage change of household's income due to the variation of wages of the household members (the effect on household members' employment is not considered in these studies).

^bIn Porto (2006) and Borraz et al (2011 and 2012), the welfare effects are estimated across household's per capita income.

^c In Nicita (2009), the effect of tariff liberalization on the price of manufacturing products is estimated across geographic areas, namely "Border", "North", "Center" and "South". The tariff pass-through at the border is about 55.6% for manufacturing and declines to an average of 15.8% in the Southern regions. The different pass-through estimates across regions results in different welfare estimates. Overall, the regions which gain the less from the liberalization are in the South (0.9%) and the regions which gain the more are at the US border (3%).

Nicita does not distinguish between traded and non traded goods, but he introduces a distinction between revenue from agricultural sales for agricultural households who are consumers and producers.

The main results from these studies are summarized in table 3. Porto (2006) finds that MERCOSUR has positive but small effects on all households and that the welfare gains are relatively concentrated on the poor households who are estimated to gain 6% in terms of expenditure power. For middle-income households, the welfare gain is estimated at about 3% of their initial revenue. In terms of the consumption effect, poor households lose purchasing power in traded goods (-0.5%) contrary to the other households. This loss is mostly due to the increase in the price of Food and Beverages which represents a relatively important share of their revenue. Similarly, the positive welfare gains from the consumption of non-traded goods are rich-biased. Finally, he estimates that the tariff changes in MERCOSUR increase relatively more the price of unskilled intensive goods and therefore increases the relative wages of low-skilled workers. This results in a positive and substantial labor income effect for poor households (+7%) and in a negative income effect for the rich (-5%). These estimates largely explain the pro-poor welfare effect of MERCOSUR found in this study. This study suggests that trade integration in MERCOSUR had a mitigation effect on inequality which was increasing in Argentina throughout the period. Such predictions can only be obtained by a fairly complete structural model that can isolate the effects of trade from other factors affecting the distribution of household income.

Using the same method, Borraz et al. (2011 and 2012) also evaluate a positive and pro-poor effect on households in Uruguay and Brazil following the elimination of tariffs for intra-MERCOSUR trade. However, as shown in table 3, they estimate a total negative welfare effect for Paraguay in real terms (from -5% for the poor to -25% for the rich) which they attribute mainly to the high elasticities of wages to the prices of traded goods, especially for high-skill workers.

Nicita (2009) estimates the pass-through of tariff changes on domestic prices faced by households. As mentioned above, he estimates an incomplete pass through²⁹ from tariffs to the prices of agricultural and manufacturing goods. He finds that the tariff liberalization results in an increase of about 1.8% in the average real income of Mexican households. This is due to the decrease of both agricultural and manufacturing goods prices which generate gains in reducing the cost of the consumption basket (1.6%) and increasing labor earnings (0.3%)³⁰. These gains compensate for the loss of revenue from agriculture sales (-0.1%). However, there are large differences in distribution of welfare gains, the largest winners being the rich, the urban, and those close-to-US-border regions. Mexican tariff liberalization is also found to increase the wage gap between skilled and unskilled laborers.

²⁹ He estimates the link between tariffs and prices of traded goods to relax the full pass-through assumption and find positive but small pass-through: 33% for agricultural products and 27% for manufacturing.

³⁰ He estimates the effect of prices on wages by controlling for various characteristics of jobs and individuals, in particular for the level of education, the type of work performed and sectors dummies. He finds a positive correlation between agricultural prices and wages and a negative correlation between manufacturing prices and wages (this explains why he obtains increased labor earnings estimates and a decrease agricultural income following the liberalization and why the skilled labor benefit more than the unskilled labor in terms of wages).

Interestingly, Nicita explains that southern and poor regions tend to rely more on revenue from agricultural sales and on low-skill wages and to have a large share of auto-consumption (up to 40%). Therefore, not only their revenue decreases (from sales of agricultural products) or increases moderately (low-skilled wages) after the tariff-cut but, in addition, households benefit little from the purchasing power improvement due to the decrease of prices. In addition to disentangling the effect of tariff reductions on prices and household incomes via effects on wages, this approach incorporating the geographical aspect of liberalization on a regional basis is pertinent for many RTAs that are typically among natural trading partners, i.e. among countries that share a border.

In sum, as noted—but not extensively documented—by Godlberg and Pavnick, these household-based econometric estimates confirm that the effects of RTAs on household welfare are highly specific to the context. This context specificity, also found in the firm-level studies reviewed in section 5, precludes drawing widely applicable conclusions.

5. Productivity and Employment Effects of exchange of market access

As with household surveys, increasing availability of firm and plant-level data gives us information to understand better the consequences of trade liberalization. The identification strategy relies on variations in tariffs, often at the HS6 or even HS-8 level. We report on recent work isolating the effects of tariff reductions in a reciprocal setting involving an exchange of market access between partners. This has three interesting features. First, tariffs are not just reduced, but entirely eliminated so some firms in the upper tail of the distribution of tariffs will face a large drop in the price of import competing products (and in some cases of intermediate inputs as well). Second, the mandated elimination of tariffs is exogenous. Third the bilateral reduction among few partners means that firms are likely to be better informed about where they can expand exports and where they have to adjust to import competition than when tariff reductions apply to all trading partners. We report on three sets of estimates. The Canada-US FTA (CUSFTA) is interesting because of good quality data and a clean policy experiment which helps to disentangle the short-run and long-run effects of the agreement. MERCOSUR is interesting because there was substantial tariff reductions among partners (for Brazil from 29 percent in 1991 to 0 in 1995) and tariffs varied greatly across industries. The reaction of Mexican firms to the large peso devaluation of 1994 provides a new exogenous mechanism linking trade and labor market outcomes including changes in the dispersion of relative wages within plants.

5.1 Short-Run vs. Long-Run Effects: Evidence from CUSFTA

CUSFTA is as close as one can hope to a clean policy experiment to assess the effects of reciprocal tariff cuts. First, no other important sector-oriented market reforms were taking place at the same time in either country. Second, trade policy is measured by the right policy indicator, tariffs. These fell to zero in a period of 8 years (1989 to 1998) from around 8 percent in Canada and from 4 percent in the US. Also, while CUSFTA had other objectives than tariff elimination (to liberalize conditions for investment and trade in services, to facilitate competition and bilateral dispute

settlement), the elimination of tariffs (and the few QRs) was the centerpiece of the agreement. At the time of the start of tariff reduction, the average effective tariff on Canadian manufacturing imports (213 industries) was 16 percent, and one in four industries had a nominal tariff in excess of 10 percent. Third, the usual concern that tariffs and tariff reductions may be endogenous because of lobbying pressure does not apply. Fourth, since this tariff elimination took place reciprocally while MFN tariffs remained largely unchanged, one can expect general equilibrium effects to be important because reciprocity meant that there were export-liberalization policies as well on both sides encouraging a reallocation of labor from import-substituting towards exporting industries/firms.

Several studies have estimated the employment effects for Canadian manufacturers. A large reallocation of labor from high to low-cost producers was expected and the political sensitivity of labor adjustments was so important that the establishment of a new labor institution, the North American Agreement for Labor Cooperation (NAALC) was formed as a prerequisite for the ratification of NAFTA. Among others, the NAALC was to analyze the labor market implications of NAFTA. In an early study, Gaston and Trefler (1997) estimated reduced-form employment and earnings equations for 19 industries over the period 1980-1993. They found that CUSFTA had a small impact on the Canadian labor market with a negligible impact on real wages and that the tariff reductions only accounted for 15 percent of the employment decline in manufacturing employment. Using the same manufacturing data over the period 1983- 1996, but disaggregating between production and non-production workers, Beaulieu (2000) showed that the brunt of adjustment was borne by production (i.e. less-skilled) workers with no declines in employment among non-production (i.e. skilled) workers. He notes (2000, p.562) that this outcome is consistent with Heckscher-Ohlin predictions as highly protected industries were unskilled-labor intensive and in line with attitudes before the agreement which showed that skilled voters supported the agreement while less-skilled workers opposed it.

The high level of aggregation in these two studies (and in all other previous studies of the effects of trade liberalization on employment, the most disaggregated level being 3-digit ISIC and 28 industries) is a major shortcoming since it precludes capturing the effect on the highly protected activities, which are linked to small clusters of product lines within the broader trade categories. Trefler's (2004) study represents a major step forward on the effects of bilateral trade liberalization on employment and labor-productivity since he works with data for 213 Canadian (and US) sectors. His outcome variable is the ratio of the annual average percentage change in employment (or labor productivity) in industry i during the period 1988-1996 over the corresponding average during 1980-1986, i.e. the first difference of the logs $(\Delta y_{i1} - \Delta y_{i0})$. This variable is regressed over the corresponding changes in preferential tariffs $(\Delta \tau_{i1}^{CA} - \Delta \tau_{i0}^{CA}, \Delta \tau_{i1}^{US} - \Delta \tau_{i0}^{US})$, industry and time fixed-effects (that disappear with first-differencing) and on controls for business conditions and industry-specific shocks (that we omit here):

$$\Delta y_{i1} - \Delta y_{i0} = \theta + \beta^{CA} (\Delta \tau_{i1}^{CA} - \Delta \tau_{i0}^{CA}) + \beta^{US} (\Delta \tau_{i1}^{US} - \Delta \tau_{i0}^{US}) + v_i \quad (0.1)$$

Besides extensive controls, this double difference over long periods obviates the need to control for dynamic estimation problems.³¹

Some of Trefler's robust industry estimates are reported in table 4. They show large employment losses (short-run labor adjustment for the most impacted industries of 12 percent and 5 percent for manufacturing as a whole). Labor productivity gains estimates are also very large, especially for the group of firms that faced the highest tariff concessions ranging from 5 to 33 percent. In his discussion, Trefler dispels the possibility that these estimates might reflect scale-efficiency gains or would not carry over to TFP and concludes that CUSFTA accounted for about half of the TFP gains in Canada over the period giving rather strong evidence that an FTA has both short-run costs and long-term efficiency gains.

Table 4: Firm-level Estimates of Productivity and Employment Effects of RTAs

<u>CUSFTA</u>						
a) Employment and productivity effects Across 213 Industries ^a						
	Employment			Labor Productivity		
Canadian Tariffs (71 Most impacted)	-0.12			0.15		
US Tariff (71 Most Impacted Labor Productivity)	-0.03 (n.s.)			0.04		
Total FTA impact (Average over 213 industries)	-0.05			0.04		
b) Sources of Productivity Gains Within and Across Plants ^b						
Change in labor productivity (1988-1996) by group (bin) size (firms starting to export) ¹	Bin 1 19.6	Bin 2 26.4	Bin 3 26.7	Bin 4 14.6	Bin 5 7.1	Total 15.3 (3.5%+0.5%) ²
Decomposition of Total (TOT) Change in labor productivity	TOT= [4.8%](within)+ [4.3%] (exit) +[4.1%] (expan.)= 13.2%					
<u>MERCOSUR: Argentina^c</u>						
	Below median			Above Median		
Δ (Skilled/Unskilled) Labor share ^d	-8%			+6%		

Sources:

^a Trefler (2004, table 1 col. 1 and table 2 col.2). n.s.: not statistically significant.

Figures are log-point changes, i.e. -0.12 is a 12 percent decline in employment. Col.1 are estimates for the 71 industries with the highest Canadian tariff concessions (ranging from -5 to -33 percent). Col. 2 is for the 71 export-oriented industries with the largest U.S tariff concessions. All estimates are averages over the 8 year period (e.g. the 15 percent increase in productivity translates into a 1.9 yearly compounded growth rate). Col 3 is the sum of the corresponding cols. (1) and (2) estimates for the whole manufacturing sector.

^b Lileeva and Trefler (2010). Sample of 5,233 plants operative in 1984 and 1996.

^c Bustos (2011, table 8) Change in the skilled/unskilled wage share attributable to the elimination of Brazil tariffs of 23 percentage points.

¹ Source is Table IV in their paper. Equal sized groups (called 'bins') ranked in increasing order (bin 1 is the small and low labor productivity group and bin 5 the largest and highest productivity group) The TOT figure reported by Lileeva and Trefler also draws on other estimates. It is the gain in productivity for all Canadian manufacturing over the period 1988-1996 (within plant increase of 4.8% includes 0.5% attributable to lower cost for US intermediates)

² Estimate for the entire manufacturing sector are extrapolated from the 23% share of manufacturing for the sample. The 0.5% is the productivity gain attributable to the lower cost of US intermediates.

³¹ Trefler uses a similar estimation for plants (he does not control for entry and exit). His estimates are similar, so that the industry-level estimates are capturing within-plant effects rather than between-plant effects. Industry-level regressions capture both within-plant and market-share shift effects.

In further work, Lileeva and Trefler (2010), search for the sources of these productivity gains by studying the evolution of exports and labor productivity for a closed sample of 6800 plants between 1984 prior to implementing the FTA and 1996 after the elimination of tariffs between Canada and the US. Between 1988 and 1996. Canadian exports of manufactures to the US increased by 75%. In that closed sample, 1600 plants exported throughout, 2100 entered into exporting during the period and the remainder (3100) remained non-exporters throughout. To compute the average tariff cut undergone by each plant, they link the tariff-cut data to a plant's HS6 commodity data. They observe differences between new exporters and non-exporters even before the FTA. New exporters employed more workers and had higher labor productivity than non-exporters. Surprisingly (in terms of the Melitz model where heterogeneity is in initial productivity and it is higher-productivity plants that would enter exporting), they find that market access to the US led small and less-productive firms into exporting. In addition to observing that productivity growth is fastest for new exporters, they find that the productivity growth differential is declining in initial productivity, i.e. productivity growth is high for less productive plants and low for more productive plants.

This exporter-non exporter productivity growth differential is consistent with a model of exporting in which there is heterogeneity in initial productivity and in the productivity gains from exporting. In this model, productivity gains from investing are decreasing in initial productivity.³² Table 4, row b) shows that labor productivity gains were declining as one moves up the distribution (bins in the table) from small and low-productivity firms to large and high-productivity firms among new exporters, a pattern that is not observed in the sample of old exporters. They also find that the new exporters (mostly in bins 1 to 2) were receiving higher tariff cuts than non-exporters. From a survey of Innovation and Advanced technologies administered to a sample of firms in their data base, they establish that the productivity gains are the result of joint decision to export and to invest in manufacturing information systems and in technologies for inspection and communication. They conclude that these patterns in the data are consistent with a situation where there is complementarity between exporting and investing, a result also observed for a sample of Argentine firms gaining access to Brazil under MERCOSUR reported below.

Table 4 row b) also gives a decomposition of the gain in productivity from CUSFTA for Canadian manufacturing. It shows that productivity gains within plants that shift to exporting (4.8%) is very high, larger than the productivity gains from plant exits (4.3%) and from expansion of high-productivity plants (4.1%). Since CUSFTA is as close as one can expect to get to an ideal situation to study the effects of an exchange of market access because of no other intervening factors, the authors concluded that it is remarkable how much a single government policy can accomplish.

³² As explained by Lileeva and Trefler, take two firms with different initial productivities that are indifferent between (1) exporting and investing, and (2) doing neither. The initially higher-productivity firm will do well in export markets so its indifference must be due to low expected gains from investing while the indifference for the low-productivity firm will come from large expected gains from investing.

5.2 MERCOSUR and NAFTA

Bustos (2010 and 2011) is also concerned with measuring the effects of substantial bilateral reductions in tariffs where the relative size of the partners is closer than in CUSFTA and the two partners are developing countries. The study rests on a balanced panel of 1400 firms, covers the period of elimination of tariffs (1992 to 1996)³³, accounts for over 90 percent of manufacturing output and contains detailed data on several dimensions of spending on technology upgrading. This allows her to construct a measure of spending on technology. This detailed data on technology spending is arguably a better indicator of productivity change than the usual productivity residuals obtained from a production function that not only capture differences in efficiency, but also factor market distortions and differences in market power. Her data also includes firm spending on labor broken down into 5 categories according to education level. During the period of implementing MERCOSUR, Argentina's exports of manufactures to Brazil increased fourfold.

Rather than comparing the productivity of exporter and non-exporters or whether productivity increases after entering the export market, her paper analyzes the effect of bilateral trade liberalization on technology adoption. In Bustos' model, firms are heterogeneous, but only in terms of initial productivity (underlying productivity differences produce a sorting in three groups: most productive firms export using advanced technology, middle-range firms export using old technology and low-productivity firms use the old technology and do not export). The key insight from her model where firms incur a fixed cost to enter the export market and to upgrade technology is that as countries engage in bilateral trade liberalization, firms lose domestic revenues (as firms from the FTA partner enter the domestic market) but also gain in export revenues with revenue gains from exports greater than revenue losses on the domestic market (from foreign firms entering the domestic market). The second effect dominates so long as firms can serve the foreign market but face entry of only a fraction of foreign firms. This reduction in variable trade costs resulting from increased export revenues then induces more firms (in the middle-range of the productivity distribution) to upgrade technology since this raises their revenues in the export market. The model also predicts that in industries where tariffs fall more, the productivity cut-offs to enter the export market and to adopt new technology fall more. However, only sufficiently productive firms upgrade their technology because the benefit of adoption is proportional to export revenues while its cost is fixed. A larger market makes it more profitable for firms to engage in productivity-enhancing activities. At the same time, as increased entry reduces the price index in the industry, the least productive firms make a negative profit and exit the market. In sum, the model predicts technology upgrading in the middle range of the productivity distribution.

When her model is confronted to the data over the period of reciprocal tariff elimination between Argentina and Brazil, she finds that the average reduction in tariffs (24 percentage points) increases the probability of entering the export market by 10 to 12 percentage points and that firms increase

³³ Between 1991 and 1994 a linear automatic reductions in tariff took place across members. The average reduction in Brazil's tariffs faced by Argentinean [Brazilian] firms over the period was 29 [13] percentage points.

spending on technology faster in industries where tariffs fall more. She finds that the reduction in tariffs only induces a statistically significant increase in spending on technology in the third and fourth quartiles and that this increase in spending on technology occurs both for continuing exporters and for new entrants so that it is crossing a size threshold rather than exporting that brings about the upgrade in technology.

In another study drawing on the same data, Bustos (2011) applies the same model to the labor market decision in which firms can again choose between two technologies, one that is high-skill intensive with high fixed costs and low marginal costs and another one that is low-skill intensive with low fixed costs and high marginal costs. Now the high-productivity firms export using the high-skill technology, a middle-productivity group exports but with low-skill technology and the least productive firms only serve the domestic market with the low-skill technology. In this version of the model, a bilateral reduction in tariffs will lead towards a reallocation of market shares towards the more productive firms leading to an increase in the relative demand for skilled workers.

Echoing the results of Galiani and Sanguinetti discussed earlier, Bustos finds that the relative employment of skilled (defined as college equivalents) labor increased by 16 percent during the period 1992-96 while the skill premium increased by 7 percentage points per year. She then finds that the increase in the relative demand for skill did not come from a reallocation of labor across sectors, nor across firms but from upgrading within firms which occurred within both production and non-production and R&D labor categories. While other reforms were also taking place in Argentina during the period (e.g. capital account liberalization), she exploits the differential reductions in Brazil's tariffs across industries to establish the effects on the demand for skill. As shown in the bottom of table 4, she finds that above (below) median firms upgrade (downgrade) skills significantly and that Brazil's tariff reductions accounted for a third of the increase in the aggregate employment share of the skilled.

In the case of NAFTA, Verhoogen (2008) exploits the large depreciation of the peso following the 1994 crisis to show that the more productive plants that produced higher-quality goods increased their market share and also paid a wage premium to maintain a higher-quality workforce. In this case too, only the larger more productive firms export. Interestingly, he shows that in the heterogeneous productivity model, an increase in the incentive to export (as following the peso devaluation) leads to differential quality upgrading across firms with an increase in within-industry wage dispersion, which is exactly what happened in Mexico (see Verhoogen (2008) figure 1).

In conclusion, the evidence is that some, but not all, firms respond to trade liberalization by increasing the skill intensity of their technology, in some cases through quality upgrading. Trade liberalization then not only increases the demand for skills by a reallocation across sectors, but also by increases in the skill intensity within firms.

6. Conclusions

The new wave of regional trade agreements (RTAs) has contributed to accelerate and deepen the integration among the partners involved. Along with the scores of Bilateral Investment Treaties (BITs), they have contributed to increase foreign direct investment especially between developed and developing countries. Although the causes vary across countries, there is general agreement that income inequality, especially when it is measured by the skill premium, has increased in many developing (and some) developed countries. However, the many studies of RTAs have had difficulty establishing significant direct effects of the RTAs themselves on the labor markets because of confounding effects. The bottom line is that context and period specificity thus precludes drawing widely applicable conclusions of RTAs on the labor markets.

NAFTA, the most studied North-South RTA illustrates the difficulty in isolating the effects of RTAs on labor markets. Ex-ante simulation-based studies concurred on a welfare gain with small predicted effects on wages and employment, welfare gains estimates that were challenged by some ex-post econometric studies. Explanations of the reversal in the Mexican wage premium under NAFTA while Mexico was following the same path of trade liberalization started under the GATT in 1986 were also reviewed. Besides other policy simultaneous changes (tightening on the US border against illegal immigrants and the peso crisis), two developments have been explored: an increase in the relative supply of college graduates not met by increases in demand; and a change in the functioning of the labor market –Mexican and American workers shifting from substitutes to complements--probably triggered or at least facilitated by NAFTA. Highly disaggregated studies of the speed of convergence of Mexican to US wages fail to show any NAFTA effect on the rate of convergence.

The paper starts with a review of the measures in RTAs that go beyond the WTO agenda to isolate the relative importance of labor measures in the agendas of deep-integration RTAs. Little progress has been achieved beyond the temporary movement of persons beyond limited mobility for skilled workers. Even though RTAs involving developing countries intend to remove barriers to labor mobility, implementation has been slow. Rather what has been observed is an increase of vertical FDI flows within partners in the RTA, especially for RTAs involving developed and developing countries. This increased vertical integration, particularly strong in NAFTA between Mexico and US, has redefined the relationship between the partners as they have become members of a production chain rather than competitors so that their workers have become complements rather than substitutes, i.e. partners rather than competitors.

We also reviewed the large ex-ante literature based on Computable General Equilibrium (CGE) models, arguing that the (largely) standard structure of these models preclude obtaining large effects on the labor market from the elimination of tariffs and other barriers to trade in goods and services. Typically, these estimates show small changes in wages and small displacements of workers across sectors. However, when incorporating wage rigidity in unskilled labor markets (or segmentation between formal and informal labor markets), predicted adjustments in the labor

markets are larger, with unemployment estimates for unskilled labor being in the 5-10 percent range.

While the ex-ante CGE models estimates abstract from most shocks and other policy changes that occurred during the implementation period of FTAs, the ex-post general equilibrium assessments based on household surveys try to control for these and to derive responses based on the differential changes in tariffs across sectors. These econometric estimates are also economy-wide insofar as the household surveys are representative. Among those reported here, like the CGE estimates, most show a welfare gain. Estimates for Mexico under NAFTA and for MERCOSUR countries show that, except for Paraguay, these RTAs are pro-poor in the sense that the households at the bottom of the income distribution gain the most.

Perhaps the most interesting results come from recent papers studying the response of firms and plants in the manufacturing sector to the large reductions in tariffs that took place under CUSFTA, MERCOSUR, and NAFTA. Particularly interesting is the 'clean' experiment of CUSFTA that revealed three robust patterns. First, short-run employment losses were large. Second productivity gains were also large. Third, the market access to the US led Canadian firms in the bottom of the distribution of labor productivity to engage in investment in technology upgrading. In MERCOSUR and NAFTA, an upgrading in technology was also observed among the firms that were led to enter (or to increase) their exports to RTA partners (Brazil for Argentine firms and the US for Mexican firms). These firms also increased their demand for skilled labor suggesting that the FTA contributed to an increase in the skill premium.

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