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IRIBA Working Paper: 05

The Impact of SENAI's Vocational Training Programme on Employment, Wages, and Mobility in Brazil: What Lessons for Sub Saharan Africa?

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July 2014

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ISBN 978-1-910502-04-4

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Abstract

The paper investigates to what extent the Brazilian SENAI system of vocational training could be a role model for easing the substantial challenges African countries face to tackle rising urbanization, high youth unemployment, and a skills gap. We first discuss relevant features of the SENAI and associated training systems as they developed over time. Subsequently, we show that the SENAI system offers opportunities for further training across the educational and race distribution as well as how the system does not appear to reach the poorest parts of the population and leaves women under represented. We then study the returns of the SENAI and other training systems on labour market outcomes and find that the S-System promotes employment prospects for all groups and the wage premia are substantial for young males, but much lower for older workers, and very low for women. SENAI also appears to promote regional migration.

Keywords: Labour markets, vocational training, school to work transition, Brazil, Africa.

Acknowledgement

This document is an output from a project funded by the UK Aid from the Department for International Development (DFID) for the benefit of developing countries. However, the views expressed and information contained in it are not necessarily those of or endorsed by DFID, which can accept no responsibility for such views or information or for any reliance placed on them.

Summary

High rates of youth unemployment, low levels of general and vocational skills, high rates of rural-urban migration, and poorly functioning labour market institutions impose great difficulties for young people to manage the school-to-work transition in Sub-Saharan Africa

In Brazil, the National Service for Industrial Training (SENAI) has existed for decades as the main building block of the Brazilian S-system of vocational training. It is a private non-profit organization, managed and led by industrial associations that have historically been considered the leading institution providing professional skills contributing to improve the school-to-work transition in Brazil. Here we investigate the lessons of this training service for Sub-Saharan Africa.

Initially, we focus on the ideological controversy that, over decades, has contextualized the political debate around vocational training, its degree of complementarity to formal education, the nature of the participant institutions and their models of financing. Then, we exploit the PNAD 2007 household survey to evaluate the SENAI in dimensions of performance, which are relevant independently of the country-specific context. Firstly, we rely on a probability model to investigate the selectivity process into training. Secondly, based on inverse probability weighting (IPW) and selectivity-adjusted estimators, we assess the impact of past training episodes on a variety of labour market outcomes. Additionally, we use quantile regressions to measure the extent in which the heterogeneity of returns to vocational training affects the urban-rural and gender earning-gaps. Finally, we use a switching regression model with endogenous switching in order to investigate the extent to which the SENAI's vocational training encourages labour mobility.

We find that SENAI graduates exhibit higher employment and productivity (hourly labour earnings) levels than non-trained workers. However, the impacts are heterogeneously distributed and favour primarily young heads of household. Moreover, the SENAI seems to supply its services without consideration of the race (or ethnic background) of the potential trainee. The same is found when analysing the geographic distribution of training. It means that the SENAI also offers opportunities for those living in less populated or less advanced federal states and that differences in participation almost entirely reflect the observed differences in population by federal states. This neutrality may play a fundamental role in Africa given the existence of multiple and competing ethnic/racial groups and it is highly relevant as Africa continues to urbanize. We argue that the federal organization of the SENAI contributes to this territorially and racially balanced output. Regarding mobility, even when there is some evidence suggesting that vocational training may discourage further human capital accumulation and therefore introducing rigidities into the labour market, we provide novel evidence that SENAI working graduates are more likely to migrate within the country relative to other workers and thus, this new evidence counters the claims of immobility.

Besides the promising performance of the SENAI in all above mentioned aspects, the fact that female SENAI graduates perform worst (relative to men) in most analysed labour market outcomes, raises the question of what explains the observed gender-related underperformance and whether this disparity is due to discrimination.

Studying the Brazilian experience provides a useful reference when analysing the particularities of the different vocational training models in Africa as well as a clear understanding of the factors that have contributed to the success and sustainability of the SENAI since its foundation in the early 1940s. The potential and limitations of the SENAI (and S-system as well) originate from its market orientation, its decentralised and self-governing federal organization, together with its financing structure (to a great extent public money). Since the SENAI can be just as good as the local employers associations are, the first and more important lesson is that the success and sustainability of SENAI-type of institutions in African countries will rely, to a great extent, on the quality of the employers' associations, a balanced financing structure providing the right incentives as well as a decentralized corporative government that ensures the required neutrality in the supply of training.

1. Introduction

Job creation in the non-agricultural sector has become crucial for policy-makers as Africa continues to urbanize. This transition is occurring in the context of a strong demographic expansion (youth bulge), only modest per-capita economic growth, huge levels of informality, and a still dominant agricultural sector (Biavaschi et al., 2012).[1] In many Sub-Saharan countries the lack of skills aggravates the situation of many young people without a post-secondary qualification. Large portions of the rural population thus either remain trapped in the declining traditional sector, or migrate to urban areas experiencing poor labour market prospects, resulting in, amongst other undesirable consequences there, such as poor standards of living, informality, and a rise in criminality (Hove et al., 2013).

In urban areas the scarcity of skills also translates into poor labour market outcomes and a problematic school-to-work transition (See Garcia and Fares, 2008a); this not only hurts the affected young people, but also the economy as a whole as the lack of skilled workers is critical for a country's productivity, growth, and international competitiveness.

Urban populations in Sub-Saharan Africa already account for about 40 per cent of the population and are expected to double by 2030 (see Hove et al., 2013 and UNPF, 2007 respectively). The fact that, on average, only about 60 per cent of young individuals have finished primary education shows that the progressive urbanization of Africa is occurring in the context of low levels of human capital (Garcia and Fares, 2008b). The urbanization process is a long-run general trend that will not be reversed. It is driven by structural change, but was also promoted by the old post-independence policies encouraging large-scale capital-intensive industries in large cities as well as exchange rate policies that negatively affected employment in the agriculture sector (Hove et al., 2013; World Bank, 1989).[2]

Consequently, one of the main challenges for policymakers in the upcoming decades in Africa will be improving the school-to-work transition. The promotion of diversified skills for dynamic and growing non-agricultural sectors is likely to play an important role in a continent where vocational training has only played a negligible role in the development of skills (DFID, 2007; Oketch, 2007).[3]

Before turning to the Brazilian experience on vocational training, we briefly provide some empirical analysis of labour market transitions in selected Sub-Saharan African countries to highlight the challenges just mentioned.

[1] The so-called "youth bulge" (term coined by Assad and Roudi-Fahimi in 2007) is a term used to reflect the fact that the labour demand is unable to absorb a demography-driven massive supply of unskilled labour.

[2] Common features of the decline of the traditional sector are large unemployment numbers, underemployment, high vulnerability to external shocks and fluctuations in commodity prices (Klasen et al., 2014).

[3] In Africa, the difficulties associated with promoting vocational training are mainly related to the general preference for general education, high shares of informality and limited institutional support (Oketch 2007; Atchoarena and Delliuc, 2001; Biavaschi et al., 2012).

1.1. Labour market transitions in Sub-Saharan Africa: The case of Liberia, Malawi and Zambia

Based on comparative analyses of an ILO-coordinated research programme on the school-to work transition in Africa including Zambia (Chigunta et al., 2013), Liberia (de Mel et al., 2013) and Malawi (Mussa, 2013), there are some labour market related commonalities worth considering.[4] For instance, education significantly influences the labour market transition of the youth with those lacking skills having particular difficulties in finding work. Most youth rely on informal networks when searching for jobs. Moreover, those working are still in their labour market transitions, as they have not yet got a suitable job for themselves (stable and satisfactory). In general, young women have to accept the only work available to them, which tends to be in low-skilled occupations. Another commonality is that the number of highly skilled youth workers does not satisfy the labour demand for professional occupations. In Liberia and Malawi, agriculture is still providing most jobs while in Zambia it is the service sector. Furthermore, in Liberia and Zambia, countries where youth unemployment rates are relatively high, the length of time spent as unemployed tends to be long. Conversely, Malawi has relatively low unemployment rates and a short unemployment duration but significantly higher rates of underutilization and underemployment.[5]

Table 1 compares country-level representative statistics on education and indicators of the labour market performance of youth in Brazil and those from the selected African countries.[6] While the education gap between Brazil and Zambia is relatively small, this is more significant against Liberia and it is immense when comparing Brazil and Malawi. Such heterogeneity is also present when considering the proportion of the youth participating in vocational education or training. According to the school-to-work transition survey (STWS) of 2012, in Malawi poor educational achievements go hand-in-hand with an almost non-existent vocational training system. On the opposite end is Zambia, with more than a fourth of its young population attending vocational training. In Brazil the proportion reached 8.3% in 2012.

This comparison suggests that Brazilians exhibit neither the highest employment (enrolment) to-population ratios nor the lowest labour market exclusion rates (discouragement, neither in employment nor in education or training NEET). The proportion of those NEET is in fact more than 5 percentage points higher in Brazil than in Liberia. However, regarding youth unemployment (relaxed and strict definitions) and underemployment, Brazil significantly outperforms the selected Sub-Saharan African countries.[7] On average, employed young individuals in Brazil work at least 20% more hours

[4] These reports are produced by the Work4Youth project by ILO and The MasterCard Foundation.

[5] Underutilization is defined as youth in irregular employment, unemployment (relaxed definition) plus youth population neither in the labour force nor in education/training as a percentage of the youth population. Underemployment is related to the weekly hours of work. In Malawi, 41.3% of the employed youth work less than 10 hours per week (Mussa, 2013).

[6] Figures based on International Labour Organization micro-data. In particular the 2012 school-to-work transition survey (STWS) and the 2012 labour demand enterprise survey (LDES).

[7] Broad unemployment (relaxed definition) is a person that (i) did not work in the reference period, (ii) was available to take up a job had one been offered in the week prior to the reference period. The strict definition includes the condition (iii) that the person sought work within the past 30 days.

per week, and the dispersion of the working time is significantly smaller than in Liberia, Malawi or Zambia.

Table 1: Labour market related characteristics of the youth population (aged 15-29).

Characteristics (percentage)	Brazil	Liberia**	Malawi	Zambia
Education level				
Primary or less	27.29	44.4	84.2	24.2
Secondary level	52.42	45.9	14.4	46.2
Tertiary level	12.03	4.7	1.1	1.8
Vocational training	8.3	5.1	0.2	27.8
Employed	53.93	52.42	66.48	43.49
Only enrolled	23.07	30.15	15.94	28.25
NEET	23.00	17.43	17.58	28.26
Unemployed (strict definition)	11.1	19.3	7.8	17.7
Unemployed (relaxed definition)	19.5	35.0	18.9	38.0
Discouraged	2.62	8.56	5.92	6.21
Hours of work (weekly mean)	38.32	32.27	23.15	29.31
Std. Dev.	16.64	25.34	20.86	24.64
Labour-related shortage*	-	23.31	14.50	49.69

Source: Author's calculations based on SWTS (2012) and LDES (2012), ILO. *Here, an enterprise with labour-related shortage declares that its biggest difficulties are due to low labour quality, and/or lack of skills, and/or low productivity and/or higher labour costs. LDES (2012) is not representative at the country level. ** Youth population are those aged 15-35.

1.2. The Brazilian experience: the S-system and the SENAI

Having as a reference the considerable heterogeneity across Sub-Saharan African countries and the challenges related to their labour market transitions, the major contribution of this paper is to assess who participates in Brazil's vocational training S-system (mainly SENAI) as well as to provide an impact evaluation of S-system training on improving the school-to-work transition.[8] In particular, enquiries about what Africa can principally learn from the National Service for Industrial Training (SENAI) and from the National Commercial Apprenticeship Service (SENAC) is of great interest.[9] Both institutions are the fundamental building blocks of the so-called S-System and share the same formal structure (De Moura Castro, 2011). The S-system is a collection of nine separate initiatives created progressively over the years aiming to prepare workers through supplying them with the skills needed in the industry as well as in other sectors. In this paper, we will focus our analysis on the SENAI's experience in supplying skills by supplementing the traditional and persistently underdeveloped schooling system. This experience can shed light on how to set up a sustainable vocational training system in Africa as well as answer the question of whether SENAI's framework holds promise to address the skills level problem and the difficult school-to-work transition in Africa.[10]

Based on the *Pesquisa Nacional por Amostra de Domicílios* (PNAD) household survey, we will evaluate the performance of the Brazilian vocational education model without having the possibility to disaggregate the performance of individual institutions of the S-system.[11] Nonetheless, it is worth noting that the SENAI and SENAC play a fundamental, dominant, and foundational role within the S-system. They were both created during the 1940s with their associated social services SESI and SESC.[12]

1.3. Vocational vs. general education

There is an old debate on the proper role of general education and the provision of vocational education. Vocational education (also known as professional education excluding

[8] The S-system consists of the National Service of Industrial Learning (SENAI), the Social Service of Industry (SESI), the National Service of Business Learning (SENAC), the Social Service of Trade (SESC), the National Service of Rural Learning (SENAR), the National Service of Learning in Transports (SENAT), the Social Service of Transports (SEST), the Brazilian Service of Support to Small and Medium-sized Companies (SEBRAE) and the National Service of Learning of Cooperatives (SESCOOP).

[9] Different from the SENAI, in the case of SENAC, employers are loosely organized and students pay for most of the training, at least in part. Thus it is considered a market-driven organization.

[10] In Brazil, low achievements in education are highly persistent when compared to other (at that time) underdeveloped countries. For instance, statistics on the average years of schooling show that Korea had 3.4 years of education in 1950 and 6.8 in 1973, while Brazil reached 2.1 and 3.8 years respectively (Maddison, 1995). PNAD 2009 data shows that in 2009, almost 60 per cent of the population achieved less than secondary education.

[11] According to Vera (2009), SENAI doubles SENAC in the number of trainees in 2007. However, there are no consolidated figures regarding the whole S-system. The PNAD is part of a long-standing Brazilian tradition of policy-relevant data collection (going back to the 1920 Census, still one of most remarkable efforts of its time.) Almost all African countries could learn from PNAD and its parent organization the IBGE – *Instituto Brasileiro de Geografia e Estatística*.

[12] The other learning institutions of the S-system are SEBRAE and SENAR, created during the 1980s, as well as SESCOOP, SENAT, and its social service SEST, which followed in the 1990s.

college education) refers to the type of education oriented to, almost exclusively, to generating skills for the labour market.

The ideological controversy is based on the idea that a vocational training system would divide the society into two groups: one group of low-skilled workers in activities with low prestige and another group in occupations associated with high incomes and status. The reason is that vocational training at the secondary level would reduce incentives to further human capital accumulation and hence constrain equal opportunity and social mobility (Fresneda, 2009).

In Europe, OECD (2005) points out that occupational shifts in the industrial sector have affected over-proportionally those graduates with a vocational education (technical level) as well as those with an incomplete secondary education, contributing to the segmentation of the labour force and increasing inequality. In the same line of criticism, Goldthorpe and Erikson (1992) and more recently Müller and Pollak (2005) claim that low levels of social mobility in Germany are a consequence of the highly developed vocational training system (See also Shavit and Müller 1998; Breen and Jonsson, 2007; Müller and Gangl, 2003; Buchmann and Park, 2009).

On the other hand, arguments favouring the promotion of vocational education are based on the decoupling that tends to occur between the academic curricula (secondary and tertiary levels) and the practical skills demanded by the enterprises, which would allow them to participate in competitive international markets, allowing the economies to transit from the export of commodities towards a diversified production with high added value (see Schwartzman and Christophe, 2005). It is also argued that vocational education could contribute to (re-) incorporating to the labour markets those who dropped out from the educational system or those with very low formal educational achievements (Forte Aguas, 2011). Schwartzman and Christophe (2005) enumerate problems related to an extensive emphasis on general education already enounced by Grubb (1985), such as educational inflation, credentialism, over-education, and the high cost associated with promoting education amongst low income families in order to maintain its relative socio economic position. The same author points out that vocational training could improve productivity in the agriculture sector, thus discouraging rural urban migration, which is relevant as Africa continues to urbanize.

It is worth noting that the consolidation and enhancement of the vocational education in Europe was a response to the efforts made by the governments for many years, but intensified during the 1980s to alleviate the high unemployment rates among the young (Mizen, 2004). In countries where vocational education (technical and technological levels) is provided, those who at the most completed secondary education spend, on average, more time searching for a suitable job and face more difficulties during their school-to-work transitions than those with vocational qualifications (Müller et al., 2003). As a result, the age profile of unemployment is less unfavourable for young people in countries with well-developed vocational training systems such as Germany and Austria even at times when overall unemployment rates are similar. Contrary to this, those reaching tertiary education

levels are more likely to experience a smoother school-to-work transition, with higher labour earnings and less unemployment than the previous groups.[13]

Regarding the structure of the vocational training in Brazil, since 1996 the legal framework ("*Lei de Diretrizes e Bases*") has stated that vocational education courses cannot substitute secondary education and vocational education can only play a complementary role (Schwartzman and De Moura Castro, 2013). It consists of professional qualification courses (of relatively low academic level) that are partially dissociated from the schooling system, the technical level (secondary equivalent), which can be obtained in an integrated manner, concomitantly or subsequently to the secondary education, and the technological level (tertiary education equivalent).[14] The latter is a less structured, less bureaucratic, more flexible in terms of its duration, and diploma-granting schema.

[13] See Bratberg and Nilsen, 1998; Mcvicar and Anyadike-Danes, 2000; Lassibille et al, 2001; OECD, CPRN 2005; Audas et al., 2005. See also Fresneda (2009) for a detailed survey of the literature on the educational trajectories (vocational vs. general education) in the European continent.

[14] See also Schwartzman and De Moura Castro, 2013.

1.4. The origins of the SENAI

During the 1930s, Brazil relied almost entirely on the import of industrial goods. In order to reduce its dependence on the troubled northern hemisphere, after World War II the country launched a big effort to industrialize the economy (known as the import-substituting industrialisation strategy). The post-World War II period also brought ideological confrontations to all levels of society. Employers assumed an anti-labour position that antagonised the leftist labour militancy and trade unions from 1945 onwards (Colistete, 2010). Starting in the 1940s, a huge flow of rural-urban migrants, badly assimilated into low-skill occupations ("unlimited" supply of low-skilled labour), encouraged high levels of income inequality in a context characterized by the neglect of the general education (Cardoso, 2008).[15] Proof of this is the fact basic education was only universalized during the late 1990s the substantial concerns about the quality of this universal basic education (Schwartzman and Christophe, 2005).

Apart from a deficient schooling system, it was also evident that there was also a lack of programmes to train skilled workers. The scarcity of skilled workers generated the necessity of implementing a vocational education model. The question of who was going to administer the model and what the model's characteristics would be were posed. Who would administrate the model was particularly controversial since historically, vocational education and the schooling system were independent of each other.[16]

Given the poor performance of the government in promoting and improving the schooling system, it was not surprising that the private sector aspired to operate the nascent vocational education system.[17] The government finally decided to create the SENAI. It was the first institution of the forthcoming S-system. The SENAI was inaugurated under the government of Getulio Vargas in January 1942, following the German and Swiss apprentice-training models (Wilson, 2006). It was organized at the national and state levels as a private, non-profit organization, financed, managed and led by the industry (Wilson, 1996; Instituto de Desenvolvimento da Guanabara, 1970).[18] Originally, the SENAI was inspired by the German and Swiss apprenticeship model of providing training as part of dual system of formal vocational training in training institutes and on-the-job training in firms. However, the on-the-job component lost momentum over time due to difficulties in finding firms willing to offer training positions. In fact, during the 1970s, only a third of all needed vacancies were available (SENAI-DR/RJ, 1979); consequently the SENAI developed as an institution providing

[15] See Ribeiro (2007) for a description of the evolution of the Brazilian education system. Over the past four decades the average years of schooling remained stagnated below four years.

[16] According to De Moura Castro (2011), in Brazil, There is and there was a clear division between the Ministry of Education and the S-System. In his words, in the overlapping areas, there is an acceptable *Pax Romana*.

[17] During the early 1940s, the Law of Industrial Education allowed the Ministry of Education to create and provide vocational education in the "Liceu Nacional no Rio de Janeiro" with support from Swiss teachers. The initiative that excluded the agriculture sector was unsuccessful and therefore cancelled (Schwartzman et al. 2000; Schwartzman and Christophe (2005). Moreover, the conflict between educators and confederations has some history. For instance, in 1971 the law 5692 reformed the education system, introducing a mandatory professional qualification as a part of the curricula in the secondary education. However, this element was already removed in 1982.

[18] See Rodrigues (1998) on the origins and the linkages of SENAI to the National Confederation of Industry.

training as a stand-alone operation not linked to a particular job in a firm, necessitating graduates to then find employment upon graduation.

Today, SENAI is considered to be among the best and oldest national training system in the world (Wilson, 1993), having benefited more than 52 million people since 1942 (SENAI-DN 2012). However, although there has been an impressive expansion of the institution, as well as a flourishing of other institutions offering vocational training, the fact remains that education in Brazil has progressively moved towards a system prioritizing the general (academic) education over vocational education which leads to younger cohorts showing high education levels and the proportion of youths attending vocational education has steadily decreased over the past four decades.[19]

1.5. SENAI and the industry

During its initial years, the SENAI played a marginal but increasingly important role in supporting the development of the industry in Brazil. Originally the emphasis was put on apprenticeships, but in the very beginning, the legislation overregulated the apprenticeship process making it unattractive to many companies causing the initial emphasis on apprenticeships to shift towards the provision of vocational training (Schwartzman and de Moura Castro, 2013).[20] In this initial stage, real wages grew slower than labour productivity, as a consequence of that, the gap between industrial wages and profits increased during the post-war years. Inevitably, the problem of income inequality encouraged antagonistic labour relations that created an unfavourable environment for fostering manufacturing quality standards (Colistete, 2010).

The stagnation of the SENAI ended in 1956, a year in which the number of new enrolments began to grow exponentially. The number of training centres doubled during the period 1964-1968, reaching about 200 units (Instituto de Desenvolvimento da Guanabara, 1970). The upsurge experienced by the SENAI over the 1960s can also be also associated with a state-led industrialization effort known as “Post Import Industrialisation” that had long run consequences (Baer, 2007). As of 1970, the share of industry in GDP had reached about 35 per cent, having remained stable over the period 1970-2000 (Kniivilä, 2007).

Then, in 1973, the oil crisis precipitated the end of the economic miracle (1967-1973) causing significant transformation within the industrial sector. The apparent stability of the industrial share of GDP concealed the fact that the industrial specialization subsequently moved away from labour-intensive activities and towards capital-intensive and natural resource-based industries, associated with substantial job losses (Cimoli and Katz, 2002). New employment possibilities shifted towards the service sector to highly remunerated occupations as well as to low-productivity activities, disequalizing the labour income distribution (ECLAC, 2004). Meanwhile, SENAI graduates were unable to find jobs and as a

[19] For instance, during the early 1970s, one third of all students were enrolled in vocational education (Hasenbalg, 2003). On the contrary, less than ten per cent were enrolled in this type of education in 2007 (PNAD, 2007).

[20] Consequently, between 1946 and 1960, the number of workers who completed some type of apprenticeship or similar programme provided by the SENAI never reached two percent of the total industrial workforce in the state of São Paulo, by far the main industrial centre in Brazil (Colistete, 2010).

result, the reputation of the institution was eroded and became vulnerable to pressures from the outside (de Moura Castro and Verdisco, 1998). All of these dynamics shaped the so-called "Lost-Decade" of the 1980s. Stagnation, increasing income inequality, unbalanced public accounts, high unemployment, and three and four digits inflation up until 1994 characterized this unfortunate period of Brazilian history (Amman, 2011; Kingstone, 2012; Kniivilä, 2007).

The SENAI, as well as other vocational training institutions in South America, could not adapt to the economic downturn and the labour-saving industrial shift which ended up reducing employment in the formal sector, increasing self-employment and expanding the informal sector (de Moura Castro and Verdisco, 1998). As the informal sector did not contribute to financing SENAI, there was no interest in training workers for this sector. Therefore, it might be argued that the SENAI's lack of adaptation was directly a consequence of its levy-based financing scheme.[21]

The trade liberalization period of the 1990s brought an important reduction of the tariff levels (Ferreira and Facchini, 2005) and a shift towards the service sector as well as the middle and high-tech industry sectors, which have been highly subsidized by the government (Kniivilä, 2007). The structural change increased the demand for workers with higher levels of qualification (CNI, 2007).[22] Contrary to what happened during the "Lost-Decade", the upsurge in reputation and enrolment in the SENAI has been progressive. Over the past two decades, SENAI has targeted actively matching the labour demand of the industry. Simultaneously, changes in the financing model of the institution (discussed below) played a role by introducing flexibility to its supply of training. For instance, during the crisis period of 2008-2010, the employment rate of the SENAI graduates did not collapse as it did in the past (SENAI-DN, 2011).[23] In 2011, about 2.5 million people were already enrolled in the SENAI in a variety of vocational training modalities (SENAI-DN, 2012).[24] The performance of the SENAI graduates throughout the crisis is also possibly a consequence of changes in the selection process into the training courses. It is likely that over the past two decades the ex-ante education and family background composition of recent graduates have improved as SENAI strengthens its reputation. Consequently, the good performance by SENAI graduates might reflect the ex-ante positive selection into training and not necessarily the true impact of training on graduates' labour market outcomes (see also below).

[21] In the region, there are some experiences in training the informal sector. The more successful of which was the *Talleres Populares* of INA in Costa Rica. *Talleres Populares* offers open courses in popular crafts and incite the apprentices to formalize soon after they start their training. These initiatives were never replicated on a larger scale (CINTEFOR/OIT, 1990 ; De Moura Castro and Verdisco, 1998). The difficulty in training the informal sector lies on the fact that there is not a single way to proceed, it is costly in term of prestige, and training for low-skilled occupations is, in most cases, not profitable (De Moura Castro and Verdisco, 1998).

[22] During the mid-2000s, more than 85 per cent of new recruits in the oil, machinery, and electronic equipment sectors had at least a secondary education. (CNI, 2007).

[23] According to SENAI-DG (2011), SENAI's employability rates from 2008 to 2010 were 48 per cent for graduates from learning and qualification courses and 75 per cent for graduates from technical courses.

[24] Vocational training modalities comprehend professional initiation courses, basic industrial apprenticeship courses, basic vocational qualification courses, mid-level technical courses, post-graduation courses, graduation courses, training courses and extension courses (SENAI-DG, 2011).

1.6. Financing of the SENAI

The SENAI is principally financed by all industrial companies with a tax of one per cent on all payrolls that serves as the basis of the contribution to the social security system. The payment is exempt from federal taxes and is collected by the National Institute of Social Security (Instituto de Desenvolvimento da Guanabara 1970; Receita Federal, 2008).[25]

It can be argued that the levy-based resources flowing to the institution are closely linked to the evolution of real wages and to the growth of the industry, thus having the disadvantage of being procyclical. As in other training institutions in Latin America, during the so-called "Lost-Decade", the budget of the SENAI was negatively affected as the industry moved towards capital-intensive and natural resource-based activities, though the levy ensured that structural resources were not cancelled or redirected to other socially productive or politically profitable activities (de Moura Castro and Verdisco, 1998).

Gasskov (1994) argues that such a financing framework tends to generate a monopoly in the training market by binding enterprises to the training institution. Consequently, there is no incentive for employers to provide in-the-job training and the lack of competition in the training market seems to be a natural outcome of the funding schema. The same study argues that the financing model tends to standardize technical programmes, offering reduced opportunities for shop-floor workers. Thus, financing that is fully levy-based can be inadequate in encouraging further developments to the training system.

During the 1990s, the centralization of the training offer started to reverse with the implementation of training agreements. In this modality, the SENAI began to supervise employer funded training rather than provide the training directly (Gasskov, 1994).[26] Additionally, revenues associated with the sale of training services to enterprises grew rapidly, significantly changing the financing structure of the institution. For instance, in 1995 the payroll tax and the sale of services represented 80.8 and 11.4 per cent of the SENAI's budget respectively. Five years later, the shares made up by the compulsory contribution decreased to 71.2 per cent while the sale of services rose up to almost 20 per cent (SENAI-DN, 2000).[27]

The current mixed financing structure has some advantages worth considering. On the one hand, the levy-based income goes directly to the training corporations, its value is protected against inflation and it provides a secure and relatively stable funding source (Gasskov, 1994). On the other hand, the progressive specialization in the sale of services offers training suppliers the possibility to offer ad-hoc training courses at an affordable cost and thus to compensate the tendency towards the mentioned standardization associated with the levy-based financing model. Thus, traditionally training-excluded enterprises have now a greater number of possibilities to find vocational training courses that are worth it to them. The flexibility associated with this financing mixture is crucial in the context of an increasing

[25] The ordinance nº 4.048/42 indicates that companies with more than 500 employees contribute 1.2 per cent on all payrolls (SENAI –DR/RJ, 1979; Receita Federal, 2008).
[26] See CEDEFOP (1998).
[27] At a subnational level, the same trend is observed. For instance, in Guanabara (nowadays Rio de Janeiro) the share of the compulsory contribution went from 97 percent in 1968 to 60.52% percent in 2013 (Instituto de Desenvolvimento da Guanabara, 1970; Sistema Firjan, 2013).

interdependence between sectors, the incorporation of other agents (universities, technical schools, consultants) and training modalities such as distance education as well as a labour market with high levels of informality.

1.7. Evaluations of the SENAI

Evaluations on the labour market outcomes of vocational training programmes in general and SENAI graduates in particular, have only recently become more available. As far as we know, the first attempt to perform a systematic evaluation can be found in Instituto de Desenvolvimento da Guanabara (1970). This evaluation struggles with a lack of definitions and agreement about the adequacy of the evaluation criteria. The characteristics of the sample do not allow making inference about the universe of SENAI graduates in Guanabara (nowadays Rio de Janeiro). Despite these drawbacks there are some elements worth considering in this evaluation as they can become relevant to the African context in the upcoming decades. For instance, Instituto de Desenvolvimento da Guanabara (1970) reports that a significant amount of SENAI graduates from the period 1965-1968 were working in a training-unrelated occupation.[28] The study indicates that this was due the lack of employment possibilities and internships vacancies, as well as the compulsory military service that interrupted the school-to-work transition.[29] Moreover, the period 1968-1970 showed a widening gap between the average real wage growth in the industry and the earnings obtained by SENAI graduates, yet the relative income loss between those aged 14-18 and those aged over 18 became smaller during the period 1965-1970 (Instituto de Desenvolvimento da Guanabara, 1970).

The SENAI-DR/RJ (1979) evaluation depicts the difficulties that SENAI faced in finding enterprises willing to offer job apprenticeship vacancies. During the 1970s, only a third of all needed vacancies were available. This report also indicates that SENAI graduates were positively selected and those who got a job after the training period, in spite of low real wages, were satisfied with their job situation. De Moura Castro (1979) reports high estimates of social rates of return, at above 20 per cent of SENAI graduates after secondary school.

Arriagada and Ziderman (1992) find favourable evidence regarding the returns on vocational education. They find that trainees and school students obtain comparable earnings when the former are employed in occupations unrelated to their field of study. Nonetheless, when trainees are engaged in occupations related to their field of study, their earnings are significantly higher than those from the formal education system.

Fresneda (2012) finds that graduates from a vocational technical education obtain a significant wage premium of about 30 percent. At the same time, they would be less vulnerable to unemployment and informality, and are more likely to enrol in a college

[28] The 64 and 47 per cent of workers aged less than 18 and adults respectively, were not working in their field of training in 1970 (Instituto de Desenvolvimento da Guanabara, 1970).

[29] PNAD 2007 shows that S-system graduates (most of them SENAI graduates) who were not working in their field of specialization in 2007 reached 59 and 43 percent for the same age categories. Due to the fact that it is impossible to compare both sets of figures, it is difficult to draw conclusions regarding a possible improvement of the assimilation rates from graduates.

education than those who at the most completed a secondary education. This study raises concerns regarding the selectivity associated with this type of complementary education since participants in the public system are mostly selected from middle-income households.

Vasconcellos et al. (2010) find a wage premium of 12%, controlling for observables for the whole sample of individuals with completed secondary education and a return of about 37% per cent for a restricted sample of children after controlling for parents' occupation as an instrument for unobservables.

As a matter of fact, little evidence has been collected to assess the relative performance of the S-system, including the SENAI, compared to other public and private training institutions. In 2007, from all the students that enrolled in vocational education at the technical levels (secondary equivalent), 45% of them did it in institutions run by the public sector, 41% enrolled in private institutions, and only 14% chose the S-System (including the SENAI).[30]

2. The data

In this study we indirectly investigate the performance of the SENAI since PNAD 2007 does not allow disentangling the contribution of the institutions that make the S-system. Based on a variety of econometric methodologies, we investigate the determinants of participation in vocational training in 2007, the labour markets outcomes (salaries, hourly wages, employment, formality, hours of work) of graduates as well as the impact of the training on workers inter-state mobility (migration). Note that, in most cases, we estimate the impacts associated with both the S-system and, with other institutions (public and private) that provide vocational training.

Tables 2 shows the individual and labour market related characteristics by current enrolment status, type of institution (S-system or others) and type of course (professional qualification or technical and technological levels) of the those individuals aged 10 or more that, according to PNAD 2007, could enrol in a vocational training course. Hereinafter, this group will be called sample 1. Table 3 depicts the same information of those currently employed.

In order to reduce the underlying heterogeneity of our estimates, the estimation of the models in the next sections will be based on successively restricted populations. Sample 2 consist of individuals aged between 15 and 29. Sample 3 restricts the sample 2 by considering only those that live in urban areas. Finally, sample 4 consists of the group of women in sample 3.[31] The estimation based on samples 1-4 provides richer information and more accurate estimates on the school-to-work transition by reducing the confounding effects coming from older cohorts, the geographic distribution of institutions supplying vocational training as well as the systematic differences by gender.

[30] According to De Moura Castro (2011), the public sector mainly consists of two modalities of technical education characterized by abundant regulation under the supervision of the Ministry of Education. These modalities are secondary technical schools and the "tecnólogos" (two-year post-secondary institutions).
[31] Socioeconomic characteristics based on sample 2 to sample 4 are available by the authors upon request.

The characterization of the eligible individuals in Tables 2 and 3 shows that enrolment in the S-system represents only a relatively small fraction of all vocational training offers in Brazil (14 percent). Nonetheless, amongst workers, the share of S-system graduates increases significantly (up to 18 percent). This information suggests that in comparison to other institutions providing vocational training, for employers and employees, the S-system seems to be an attractive training option.

Both tables also show that there are systematic differences in the socioeconomic characteristics of trainees that depend on the type of institution (S-system or others) and the type of received training (professional qualification or technical and technological). In general, S-system trainees are over proportionally male, non-enrolled in the schooling system, heads of household, with bi-parental families living in the northern and southern parts of the country.

Amongst workers, trainees in technological and technical areas earn, on average, more than their counterparts with a professional qualification, yet trainees in this group, which represent about 80% of the S-system enrolled workers, seem to earn on average slightly less than those currently enrolled in other training institutions. Workers' affiliation to a union is proportionally more frequent amongst those enrolled in the S-system when compared to those enrolled in other training institutions. Finally, compared to other institutions, S-system trainees are over proportionally selected from workers in the production (reparation and maintenance) of goods and services as well as from the transformation industry (*indústria de transformacão*).[32]

[32] This section includes those activities that involve the physical, chemical and biological substances, materials and components in order to obtain new products. The materials, substances or components transformed are raw materials produced in the agricultural, forestry, mining, fishery products and other industrial activities.

Table 2: Individual and household related characteristics of vocational training eligible (Sample1).

	Non-enrolled	Enrolled in Vocational Training					
Characteristics for Sample 1 (Aged >10)	-	Professional Qualification		Technical and Technological		Total	
		S-System	Other institutions	S-System	Other institutions	S-System	Other institutions
Observations	320,629	1,430	8,303	255	1,984	1,685	10,287
Populations	151,223,159	691,690	4,100,807	140,673	993,127	832,363	5,093,934
Enrolment in vocational Training (%)	-	11.7	69.2	2.4	16.8	14.0	86.0
Individual Characteristics (% or years)							
Average Age	36.5	31.5	25.9	26.8	27.3	30.7	26.2
Female	51.4	41.0	58.2	28.9	53.6	39.0	57.3
Years of education	7.8	10.3	9.8	11.9	11.9	10.5	10.2
Without education	10.6	1.4	1.2	0.0	0.0	1.2	0.9
Incomplete basic	43.9	20.0	30.9	0.0	0.0	16.6	24.9
Complete basic	9.7	14.7	12.0	5.5	6.8	13.1	11.0
Incomplete secondary	6.5	15.0	15.2	20.0	19.5	15.9	16.0
Complete secondary	19.0	39.4	29.1	62.4	57.6	43.3	34.6
Incomplete tertiary	3.7	4.0	3.9	5.6	10.4	4.3	5.2
Complete tertiary	6.6	5.4	7.8	6.5	5.7	5.6	7.4
Children's father- tertiary ed.	1.9	2.3	2.8	1.1	2.9	2.1	2.8
Avg. household education	4.7	5.3	5.3	6.0	6.0	5.4	5.4
Enrolled	23.5	25.2	46.6	29.0	40.3	25.8	45.4
Ethnic I (white)	49.5	52.6	52.8	67.0	59.2	55.0	54.0
Ethnic II (mulatto)	41.8	40.0	39.0	25.0	31.7	37.5	37.6
Ethnic II (others)	8.8	7.5	8.2	8.0	9.0	7.6	8.3
Vocational training in the past	-	29.0	26.0	25.6	29.4	28.5	26.7
Household related variables (percent.)							
Bi-parental household	74.2	78.3	74.1	77	73	78.1	73.8
Household size	4.1	3.9	4.1	3.7	3.9	3.9	4
Head of household	36.0	35.8	19.3	22.6	22.1	33.6	19.9
Spouse	23.9	18.6	17.1	11.3	14.6	17.4	16.6
Children	31.4	38.7	54.6	59.0	56.5	42.2	55.0
Others	8.7	6.9	9.0	7.0	6.8	6.9	8.6
Female with children under 5	6.6	5.3	5.7	4.7	5.2	5.2	5.7
Geographic region (percentages)							
North	7.8	6.8	5.9	4.8	5.6	6.4	5.8
Northeast	27.5	20.2	22.3	8.8	16.9	18.3	21.2
Southeast	42.9	43.4	49.2	59.1	53.7	46.1	50.1
South	14.6	21.4	15.6	19.9	19.3	21.2	16.3
Midwest	7.3	8.2	7.1	7.3	4.5	8.0	6.6

Source: own calculations based on PNAD 2007.

Table 3: Labour market related characteristics of vocational training eligible (employed).

	Never enrolled	Enrolled in Vocational education					
Characteristics for Sample 1 (Aged >10)	-	Professional Qualification		Technical and Technological		Total	
		S-System	Other institutions	S-System	Other institutions	S-System	Other institutions
Observations	160,353	911	3,718	169	1,176	1,080	4,894
Population (with labour earnings)	75,623,882	444,438	1,854,157	94,779	595,005	539,217	2,449,162
Enrolment in voc. Training (%)		14.9	62.0	3.2	19.9	18.0	82.0
Labour markets statistics							
Labour earnings (*Reais* 2007)	955	929	953	1,021	960	945	955
Working hours (weekly)	39.5	39.7	37.1	40.5	38.5	39.8	37.4
Union membership (%)	16.9	19.3	16.6	19.3	18.2	19.3	16.9
Formality (%)	32.2	47.4	29.9	56	45.7	49	33.1
Recent migrant (%)	7.7	8.7	8.3	8.6	9.1	8.7	8.5
Occupations (percentage)							
C.E.Os and Managers	4.7	5.1	4.9	4.2	4.9	4.9	4.9
Professionals	6.5	4.6	9.6	3.6	8.4	4.4	9.3
Technicians	7.2	9.4	12.4	16.1	21.4	10.5	14.5
Administrative workers	8.5	11.1	14.0	14.6	20.9	11.7	15.6
Service workers	20.7	18.4	22.9	10.9	14.9	17.1	21.0
Tradesman	10.0	10.9	12.4	10.1	10.5	10.8	11.9
Agriculture workers	18.8	5.9	5.1	2.5	2.6	5.3	4.5
Goods, services producers	23.1	33.2	18.0	36.9	15.5	33.8	17.5
Military	0.6	1.6	0.7	1.1	0.8	1.5	0.7
Others	0.0	0.0	0.1	0.0	0.1	0.0	0.1
Sectors (percentage)							
Agriculture	18.8	6.2	5.3	2.5	2.6	5.6	4.6
Other industrial activities	0.8	0.7	1.0	2.9	2.3	1.1	1.3
Transformation industry	14.1	23.0	16.1	36.2	18.6	25.3	16.7
Construction	6.9	6.1	3.4	2.5	3.2	5.5	3.4
Commerce	17.8	22.6	20.7	24.0	20.8	22.9	20.7
Hotels and Restaurants	3.9	4.3	4.7	2.5	2.1	4.0	4.1
Transport and telecommunication	4.7	6.1	3.5	1.8	4.6	5.4	3.7
Public administration	4.8	5.6	6.1	3.4	7.3	5.2	6.4
Education, health and social serv.	8.8	6.8	15.1	11.0	19.9	7.5	16.2
Domestic services	8.1	4.2	7.1	1.5	4.0	3.8	6.3
Other collective and social serv.	3.9	6.5	7.2	3.3	4.5	5.9	6.6
Other activities	7.5	7.9	10.0	8.4	10.1	7.9	10.0

Source: own calculations based on PNAD 2007.

Note: Formality is defined as individuals contributing to social security system, contract, public servants, military and employees with more than five workers in non-agricultural activities.

3. Determinants of participation in vocational training

3.1. Model of participation

In order to avoid endogeneity issues, we consider only those individuals eligible for vocational training without a migration background. This is only a fraction of the population, representing approximately 55 percent of those eligible individuals described in Table 2. Based on sample 1 (all individuals older than 10) to sample 3 (individuals aged between 15 and 29 in urban areas), we estimate survey design-adjusted probit models for the probability of current participation in a vocational training course. In order to explain the enrolment decision, we include the age of the potential participant, the individual's level of education, gender, family education indicators to control for unobservables and the ethnic/racial backgrounds of potential participants.[33] Additionally, the model includes the individual's position within the household (head of household, spouse, children and others), the bi-parental condition of the family, the interaction between females and children under the age of five, the household size, region dummies, as well as the current enrolment in the schooling system and the employment status. Furthermore, we include interactions originating in the labour market for the employed individuals. The interactions include: currently working in the formal sector, union membership, hours worked during the past month as well as controls for the economic sector and occupation.[34] Table 4 shows the results of the probability estimation by sample (1-3) and type of institution. Further analysis can be carried out based on Tables A.1 and A.2, which show probability models for the enrolment in training courses of professional qualification and in courses at the technical and technological level respectively.

Results in Table 4 indicate that, in general, trainees tend to be younger and the ones in the S-system tend to be older than their counterparts in other training institutions. This age effect is stronger for young cohorts (sample 1 versus sample 2) while the rural condition seems to be uncorrelated to the age-enrolment profiles (sample 2 versus sample 3).

Regarding the selection in education, our results suggest an inverse U-shaped relationship between the educational level and the enrolment probability. The inflection point is found at the level of completed secondary education. Those in school-to-work transition age are additionally positively selected on the human capital endowments of their families (average household education). Consequently, the current patterns of enrolment in vocational training confirm the concerns that vocational education does not particularly attend to the needs of less skilled populations, and therefore, the SENAI and other vocational training institutions could do more enhance the social mobility of the disadvantaged (see Fresneda, 2012).

[33] The controls for unobservables consist of an index of tertiary educated father for children and the average household education, excluding the potential participant.

[34] Formal workers are defined as those contributing to the social security system in their principal or secondary occupation, those with formal working contracts, military, public servants, and employers with more than five employees in non-agricultural activities.

Table 4: Probability model for the enrolment in vocational training, 2007

Survey: Probit regression	Dependent variable: enrolment in vocational training, by type of institution					
Population	Sample 1		Sample 2		Sample 3	
Variables / Type of institution	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
Age	-0.007***	-0.013***	-0.029***	-0.032***	-0.030***	-0.032***
Incomplete basic	0.260**	0.369***	0.200	0.368***	0.141	0.416***
Complete basic	0.747***	0.746***	0.501**	0.717***	0.452**	0.730***
Incomplete secondary	0.911***	0.921***	0.777***	0.903***	0.716***	0.891***
Complete secondary	0.940***	1.036***	0.861***	1.102***	0.799***	1.055***
Incomplete tertiary	0.490***	0.569***	0.353*	0.594***	0.279	0.594***
Complete tertiary	0.611***	0.802***	0.331	0.873***	0.272	0.837***
Children x father's educ. (T)	-0.320***	-0.110**	-0.397***	-0.196***	-0.399***	-0.198***
Avg. household education	0.016**	0.012***	0.022**	0.006	0.008	-0.002
Female	-0.203***	0.073***	-0.308***	0.029	-0.324***	0.020
Ethnic I (white)	-0.035	-0.037	-0.066	-0.036	-0.052	-0.043
Ethnic II (mulatto)	-0.003	-0.024	0.010	0.003	0.018	0.010
Bi-parental household	0.096**	0.024	0.132***	0.045*	0.143***	0.061**
Spouse	-0.085	-0.051*	-0.140	-0.050	-0.115	-0.055
Children	0.050	0.077***	-0.028	0.054	0.005	0.066
Other household member	-0.028	0.021	-0.120	-0.011	-0.088	-0.017
Household size	-0.035***	-0.037***	-0.048***	-0.034***	-0.044***	-0.030***
Female x children under 5	0.058	-0.099***	0.083	-0.115**	0.020	-0.112**
Northeast	-0.050	0.053	0.005	0.047	0.012	0.058
Southeast	0.041	0.207***	0.122	0.168***	0.103	0.166***
South	0.163	0.232***	0.184*	0.175***	0.182	0.170***
Midwest	0.055	0.075	0.106	0.048	0.038	0.016
Enrolled in school system	0.060	0.288***	0.043	0.245***	0.020	0.215***
Employed	0.137	-0.293***	0.111	-0.477***	0.071	-0.575***
Interactions with employed						
Formal	0.133***	-0.081***	0.224***	-0.073**	0.245***	-0.066*
Union membership	0.037	0.117***	0.072	0.147***	0.071	0.159***
Hours of work	-0.002***	-0.001***	-0.003***	-0.001***	-0.004***	-0.001***
Industrial activities	0.033	0.309***	-0.003	0.555***	-0.190	0.566***
Manufacturing	0.107**	0.129***	0.068	0.114***	0.064	0.111***
Public administration	-0.025	0.078*	-0.105	0.039	-0.096	0.012
Education and health	0.061	0.154***	-0.070	0.130***	-0.043	0.115**
Other Services	0.172**	0.150***	0.008	0.117*	0.018	0.131**
Managers	0.078	0.387***	0.180	0.403***	0.264	0.495***
Professionals	0.027	0.441***	0.248	0.601***	0.323	0.688***
Technicians	0.168	0.538***	0.431**	0.652***	0.514*	0.730***
Craftsman	0.120	0.423***	0.289*	0.593***	0.369	0.671***
Service workers	0.196**	0.459***	0.339**	0.610***	0.413	0.660***
Trade workers	0.243**	0.433***	0.484***	0.570***	0.549**	0.630***
Goods, services producers	0.275***	0.318***	0.360**	0.416***	0.425	0.466***
Constant	-2.985***	-2.318***	-2.316***	-1.810***	-2.137***	-1.738***
Observations	174872	180305	67046	70351	54798	57747
Population	83282219	85990337	31161384	32768719	25145643	26567877
Design df	5455	5493	4999	5040	4658	4691
F-statistic	18.276	82.743	10.278	40.617	8.717	27.284
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Number of Strata	637	699	627	649	592	592
Number of PSU	6092	6192	5626	5689	5250	5283

Excluded Categories: No education, Male, other ethnic groups, heads of household and northern region, non-enrolled, unemployed.
Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. All treatment effects are significant at least at the 5% level.* Not significant at the 10% level.
Source: Author's calculation based on PNAD 2007 data. * p<.10, ** p<.05, *** p<.01

Confirming the figures in Table 2, enrolment in the S-system is strongly biased against women while enrolment in other institutions favours women in older cohorts (sample 1 versus sample 2). The ethnic dimension does not appear to play any role in determining enrolment. Consequently, it is possible to state that differences in Table 2 respond exclusively to different endowments and different race groups.

Those belonging to a bi-parental household are more likely to be enrolled in vocational training; however, the bi-parental condition of a household also favours the enrolment in the S-system more. Consequently, if vocational education is considered an investment in human capital, it is possible to conclude that investments associated with the S-system are higher than those in other institutions. Interestingly, we find that women with children under the age of five reduce their probability of enrolling in other institutions, while this

probability is not affected in the case of enrolment in the S-system. This result is not trivial. It implies that the cost of child rearing (associated with enrolment in the S-system) is spread across women of all ages and it is not attached exclusively to woman at the reproductive age. At this point, it would be recommendable to further study the enrolment mechanisms of the S-system that avoid women with responsibilities, causing them to become disadvantaged when compared to women without small children. At the same time, the general gender bias in the S-system should be called into question.

Regarding the geographic determinant of enrolment, significant coefficients by regions can be interpreted as regional distortions in the supply of vocational education relative to the mass of workers. Our results suggest that the S-system tends to, in some degree, over-supply the population in the south of the country (*Paraná, Santa Catarina* and *Rio Grande do Sul*). The other institutions providing vocational training over-supply to a greater extent in the same regions, but also do so in the south eastern region (*Espírito Santo, Minas Gerais, Río de Janeiro* and *São Paulo*).

While enrolment in the school system does not affect the probability of being trained in the S-system, it strongly correlated to training activities in other institutions. It seems that there is a neutral relationship between formal education and the S-system and a complementary relationship with the other institutions. This asymmetry could reflect the fact that being enrolled in the S-system is associated with a balanced mixture of concomitant and subsequent provisions of training while the enrolment in other institutions has mixture biased towards integrated and concomitant modalities. The same idea is reinforced by the fact that trainees in other institutions are less likely to currently have a job than their non-training-enrolled counterparts, however the likelihood of enrolment in the S-system is not associated with the employment status. These results suggest a higher relative prevalence of training of currently employed in the S-system compared with other suppliers of vocational education.

Amongst the employed population, workers in the formal sector are more likely to enrol in the S-system, while their counterparts in the informal sectors seem "to prefer" other training institutions.[35] While workers in the service and trade sector as well as in the production (reparation and maintenance) of goods and services have a higher probability to enrol in the S-system, agricultural workers are clearly less likely to enrol in other (private and public) training institutions.

3.2. The selectivity process into the S-system and other institutions

In courses of vocational education, there are systematic selectivity differences between those enrolled in upper level courses (technical and technological - secondary and tertiary equivalent) and those enrolled in professional qualification courses (middle-low qualification level).

[35] The high correlation between union membership and formality may explain why union status appears to be uncorrelated with training in the S-system.

Based on results in Tables 4, we find that for upper level courses, women, children and other household members as well as those currently enrolled in the schooling system are less likely to be selected into the S-system when compared to other alternatives of vocational training. Note that the bias against female enrolment in the S-system is important in magnitude, highly significant, and is found even after controlling for employment status and its interactions with economic sectors and occupations, the position within the household as well as having children under their responsibility. On the contrary, males currently employed in formal jobs as well as those coming from bi-parental households have a higher relative likelihood of being enrolled in the SENAI, while union status plays no role. Older cohorts, technicians, those working in other industrial activities and those living in the southeast of the country or with a tertiary education are relatively less likely to be enrolled in the S-system. On the contrary, mulattos are positively selected into the S-system when compared to other alternatives. Amongst younger cohorts (aged between 15 and 19 – sample 2) we find that the individual's position within the household plays a key role. It seems that enrolment in the S-system is more likely amongst heads of household (excluded category) as well as amongst those in full time jobs (working more hours a week).

Regarding the courses of professional qualification (middle-low skills level), compared with other alternative vocational training institutions, those with a higher education, or who are children (lower domestic responsibilities), or have smaller families, or are employed in formal jobs or in the manufacturing sector are more likely to be selected into the S-system. Contrarily, amongst young cohorts, while union status, the ethnic background, enrolment, and the employment status play no role, women and those currently in the school are less likely to attend the S-system.

We hypothesise that these cohort effects can be understood as an indication those with domestic responsibilities expect to improve their labour market outcomes by enrolling S-system upper level courses. On the contrary, those with less domestic responsibilities tend to prefer professional qualification from institutions outside of the S-system. This is presumably because of the flexibility associated with the heterogeneity of the many institutions, which according to PNAD 2007 provide 86 per cent of the total training in Brazil. In order to investigate this hypothesis, the next section focuses on investigate how training impacts labour markets outputs.

4. Vocational training graduates and labour market outcomes

In this section, we investigate whether past vocational training episodes influences current labour market outcomes. In particular, we are interested in assessing its impact on monthly labour earnings, monthly hours of work, hourly wages (as an indicator of productivity) and the probability of being employed in the formal sector (as defined previously). All of these average treatment effects estimations are based on valid observations of employed individuals that reported labour earnings where the reported estimates are extendable to the whole working population and not only to the treated (trained) population. Most of these individuals have never been enrolled in any vocational training and are consequently considered as a control group. Next, based on the eligible population for vocational training,

we estimate the impact of vocational training on the employment probability (also by institutions). Finally, by restricting the sample to graduates, we estimate the differential impact of S-system training on the probability of working in the same training area. All models are estimated across sample 1 to 4, as well as by individual's position within the household. The idea of such a disaggregation strategy is to account for the multidimensionality of vocational training. Thus, our results will reflect the differences in impact by cohort, geography, gender and individual's household position.

4.1. Impact evaluation of SENAI

In order to estimate the average treatment effect (ATE) on the labour market outcomes caused by a previous training experience, we rely on inverse probability weighting (IPW) estimators.[36] The methodology was chosen taking into consideration the dynamic nature of the enrolment decision. Vikström (2014) suggests that this estimator is suitable and even preferred to other matching estimators in treatment evaluations in a discrete time setting where the intervention could begin at any point in time in the past.

Consider outcome y (for example, labour earnings) and a binary treatment variable $t \in \{0,1\}$, for instance, the graduation from a vocational training course provided, for example, by the S-system (or alternatively by other institution). Additionally, assume that the potential outcomes y_0 and y_1 depends on the treatment (training). Then, it is necessary to obtain the mean labour earnings for trained individuals $t = 1, E(y_1)$ which is observed when $t = 1$ and unobserved when $t = 0$.[37] The treatment effect estimation problem is thus not different than solving a missing-data problem.

An IPW estimator for $E(y_1)$ is :

$$\frac{1}{N}\sum_{i=1}^{N} y_t t_i \Big/ p(X_i)$$

where $p(X_i)$ is the probability that $t_i = 1$ (to be trained or graduate), which is a function of the observable determinants X_i. The IPW estimator weighs asymmetrically on those observed outcomes event though the observation was not probable.

In order to properly estimate the effect of S-system training as well as the effect of training by other institutions, a probit model is estimated where the dependent variable takes the value of one if the individual was trained sometime in the past and zero if he/she did not have any training experience. The vector X_i of determinants contains only exogenous variables. That is, only variables that cannot be affected by the current outcome (for example, labour earnings), as well as variables that may have changed between the training event and the current outcome (for example, to get married). Thus, the selection of variables

[36] IPW dates back to Horvitz and Thompson (1952). Since then, researchers have been actively trying to extend this approach to deal with modern treatment-effect estimation problems in the field of biostatistics and econometrics (see Robins and Rotnitzky, 1995; Robins, Rotnitzky, and Zhao, 1994 and 1995; Wooldridge 2002, 2007 and 2010; Hirano, Imbens, and Ridder, 2003).

[37] The observed data ($y_i t_i$) corresponds to y_{1i} for trained individuals and is missing for their non-trained counterparts.

determining the probability of enrolment is difficult since the temporal dimension of the training event is missing and important information prior to the training event is also neglected. Additionally, propensity score methodologies rely on the assumption that unobservables play no or at least only a small role in determining participation (see Dehejia, 2005; Zhao, 2004). For this reason, the evaluation literature is abundant in recommendations about the inclusion of instruments for talent, motivation and other non-observable characteristics. Nevertheless, even when the availability of instruments is reduced, at least for children, we instrumented those unobservables by using the education achievements of their parents.

Table 5: Average treatment effect of vocational training on selected variables, 2007

Vocational training (All courses)											
	Monthly earnings		Monthly working hours		Hourly labour earnings		Formality		Employment		Employment in same area
	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system
Absolute effect of training (units)											
Sample 1	68	109	0.4	1.7	0.30	0.60	0.09	0.08	0.10	0.10	0.08
Sample 2	168	63	-1.1	2.0	0.86	0.35	0.09	0.09	0.07	0.09	0.11
Sample 3	87	54	-0.4	1.6	0.26	0.25	0.06	0.08	0.07	0.06	0.12
Sample 4	0	16	-0.2	2.0	-0.23	-0.02	-0.03	0.04	0.09	0.09	0.12
Predicted outcome mean without training (units)											
Sample 1	859	892	180	180	5.50	5.73	0.57	0.59	0.56	0.57	0.50
Sample 2	593	607	182	182	3.74	3.85	0.54	0.56	0.58	0.59	0.37
Sample 3	637	645	183	183	4.03	4.12	0.58	0.60	0.62	0.63	0.38
Sample 4	595	600	170	171	4.24	4.26	0.59	0.61	0.49	0.51	0.35
Relative effect (percentage)											
Sample 1	7.9	12.2	0.2	0.9	5.5	10.5	16.0	13.2	17.3	18.1	15.9
Sample 2	28.3	10.4	-0.6	1.1	23.1	9.0	16.1	16.6	12.3	14.7	30.8
Sample 3	13.7	8.4	-0.2	0.9	6.5	6.0	9.9	13.4	10.5	10.0	32.0
Sample 4	0.0*	2.7	-0.1	1.2	-5.5	-0.5	6.0	6.0	17.6	17.6	33.2

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3). All treatment effects are significant at least at the 5% level.* Not significant at the 10% level.

Based on the PNAD 2007 data, the vector X_i consists of the age and its squared, parental education (in the case of those in a child's position within the household, gender, ethnic background (white, mulatto or others), rural area, federative unit and educational level. To avoid endogeneity issues and make our estimation more reliable, we exclude currently enrolled individuals (school or training) as well as those with an inter-municipal migration background since they could move after training and therefore biasing the estimated impacts.

Table 5, 6 and 7 refer to the impacts of all vocational training, professional qualification courses and technical/technological courses, respectively. The tables show the IPW estimated impacts on all variables of interest by institution and sample. A disaggregated view (by individual's position within the household) of the impacts can be found in the Appendix Tables A.3 to A.8.

Table 5 shows the significant labour earnings premium obtained by S-system graduates, which on average was about of 28 percent for workers aged between 15 and 29 (sample 2). The fact that the impact decreases in sample 3 (only urban areas for the same cohort) indicates that the S-system has an even greater premium in rural areas. The relatively low premium in sample 1 indicates that older cohorts do not obtain a significant labour earnings premium and even probably suffer income losses. This might either relate to lower effects of SENAI in the past or that these effects dissipate over time; as we are using cross-sectional data, we are unable to differentiate among the two hypotheses. The contrary occurs with other suppliers of training. They exhibit higher returns for older cohorts and a small difference between rural and urban areas. In both cases, women do not obtain an important training premium (sample 4). The impacts on the intensity of work are very small. Instead, training appears to increase labour productivity and as a consequence, hourly wages rise. This is also true for the monthly earnings patterns with the exception of urban women (sample 4). For this group, training seems to negatively affect its labour productivity.

In general, vocational training induces higher levels of formality with no big difference existing between the S-system and other institutions. The same happens regarding improvements in the employability of training graduates. The most important differences between the S-system and other training institutions are related to the specificity of the training. As a matter of fact, the young cohort of S-system graduates are about 30 percent more likely to work in an occupation related to the training area.

Regarding differences between professional qualifications and upper level training (Table 6 and 7), in the case of young women in urban areas (sample 4) the general loss of productivity can be decomposed into a small but widespread decay in productivity and work intensity in the case of professional qualifications. Contrary to this, women with upper level training increase their labour earnings by increasing the number of hours of work, even when their hourly salaries decline by about five percent. Note that the positive impact of the S-system on labour earnings is much more accentuated for those with upper level training.

Table 6: Average treatment effect of professional qualification training on selected variables, 2007

	Professional Qualification										
	Monthly earnings		Monthly working hours		Hourly labour earnings		Formality		Employment		Employment in same area
	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system
	Absolute effect of training (units)										
Sample 1	68	117	0.6	2.4	0.34	0.59	0.09	0.08	0.10	0.10	0.07
Sample 2	157	52	-1.1	2.9	0.84	0.24	0.09	0.10	0.07	0.09	0.12
Sample 3	84	40	-1.3	2.5	0.28	0.11	0.06	0.08	0.07	0.06	0.13
Sample 4	-17	16	-2.3	2.7	-0.22	-0.01	-0.05	0.03	0.10	0.09	0.13
	Predicted outcome mean without training (units)										
Sample 1	856	864	180	180	5.47	5.55	0.57	0.58	0.56	0.57	0.51
Sample 2	591	596	182	182	3.73	3.77	0.54	0.55	0.58	0.59	0.35
Sample 3	634	634	183	183	4.03	4.04	0.58	0.59	0.62	0.62	0.36
Sample 4	595	591	170	170	4.23	4.20	0.59	0.60	0.49	0.50	0.33
	Relative effect (percentage)										
Sample 1	8.0	13.6	0.6	2.4	6.3	10.6	16.2	13.4	17.3	17.3	13.4
Sample 2	26.5	8.7	-1.1	2.9	22.4	6.3	16.1	17.4	12.3	14.6	34.8
Sample 3	13.2	6.3	-1.3	2.5	7.1	2.7	9.6	13.9	11.2	9.4	36.5
Sample 4	-2.9	2.6	-2.3	2.7	-5.2	-0.3	-8.1	4.4	20.4	17.1	40.0

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3). All treatment effects are significant at least at the 5% level.

Regarding the impacts on formality and employment, the differences are concentrated in the dissimilar impact on women. On the one hand, S-system graduates from courses of professional qualifications are more likely to have a job as well as a job in the same area of training. The price for that is that they are also less likely to work in the formal sector. On the other hand, S-system graduates from upper level courses are more likely to formalise, but with less success in terms of employability and permanence in the training area.

This information suggests that, while women with professional qualification training seem to stagnate in low prestige occupations, their counterparts who received upper level training (technical and technological) seem to enjoy higher mobility levels.

Table 7: Average treatment effect of technical and technological training on selected variables, 2007

Technical and Technological level											
	Monthly earnings		Monthly working hours		Hourly labour earnings		Formality		Employment		Employment in same area
	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system	Other inst.	S-system
Absolute effect of training (units)											
Sample 1	65	86	-1.3	-0.3	0.02	0.64	0.08	0.08	0.10	0.12	0.12
Sample 2	235	105	-0.8	-1.2	1.01	0.77	0.09	0.08	0.07	0.09	0.09
Sample 3	104	106	4.6	-1.5	0.14	0.75	0.07	0.07	0.04	0.08	0.09
Sample 4	106	18	12.7	-0.3	-0.34	-0.05	0.09	0.07	0.02	0.10	-0.05
Predicted outcome mean without training (units)											
Sample 1	880	970	181	180	5.66	6.24	0.58	0.62	0.57	0.58	0.53
Sample 2	605	649	182	182	3.79	4.14	0.55	0.60	0.59	0.61	0.48
Sample 3	654	686	183	182	4.08	4.40	0.59	0.63	0.63	0.64	0.49
Sample 4	595	631	170	171	4.28	4.47	0.60	0.64	0.60	0.53	0.46
Relative effect (percentage)											
Sample 1	7.4	8.9	-0.7	-0.2	0.3	10.2	14.4	12.5	16.9	20.0	23.2
Sample 2	38.8	16.1	-0.4	-0.7	26.6	18.5	16.5	13.7	12.2	15.5	18.1
Sample 3	15.9	15.4	2.5	-0.8	3.4	17.1	11.4	11.6	7.0	12.1	18.2
Sample 4	17.8	2.8	7.5	-0.2	-7.8	-1.0	14.1	11.2	3.1	19.0	-11.3

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3). All treatment effects are significant at least at the 5% level.

4.2. The Heckit approach

One of the limitations of the propensity score methods when estimating average treatment effects lies on its inability to control for factors beyond the researcher's control. Unobservables are then a potentially dangerous source of bias. These methods offer great flexibility because they do not rely too much on a functional forms or impose strong statistical assumptions on the outcome equation. On the contrary, the Heckman sample selection model (Heckit approach) has complementary characteristics that can be used to investigate the extent to which unobservables are associated with the outcome variable. The disadvantage is that it imposes strong restrictions to the joint behaviour of unobservables. The Heckit model is thus estimated in this evaluation context to assess the impact of vocational training provided by S-system on labour earnings after controlling for unobservables.

In order to avoid endogeneity issues, we consider only non-enrolled individuals without an inter-municipal migration background. The included variables in the outcome equation are the level of education, S-system background, the average level of education of the family, potential experience and its squared, union membership, the number of children in the household, ethnic background (white, mulatto or others), rural condition as well as controls for economic sector and occupation. The selection equation relies on almost the same

determinants, the exclusion variable being a dummy variable whether an individual lives in a bi-parental household. Note that because the inverse Mill's ratio (IMR) is a nonlinear function of the explanatory variables in the probit model (first-step), then the second-stage equation is identified even if there is perfect overlap in the variables in the selection and outcome equations. Having a variable in the selection equation that it is not included in the outcome equation is, however, recommended since this is parsimonious procedure.

Table A.9 in the appendix presents the results of the wage corrected equation for samples 1-4. In general, this model confirms the positive impact of S-system training on earnings and employment. The fact that the young cohort at the country level shows a negative coefficient for the IMR suggests that there are unobserved factors upwardly biasing the returns to endowments. Thus, there is the potential that unobservables may bias upward the estimations based on the propensity score in at the very least sample 2. Consequently, it is safe to conclude that the S-system premium on monthly labour earnings is located between almost 9 and 30 percent, being consistent with the findings by Fresneda (2012) and Vasconcellos et al. (2010). Additionally, we find a significant impact on the employment prospects of young individuals. The selection equation confirms that the S-system increases the chances of employment for women. This positive outcome is occurring in the context of extremely low enrolment chances for women relative to men. Consequently, the questions whether women's relative difficulties in accessing the S-system are basically explained by demand factors (women's preferences) or by discrimination, are crucial.

4.3. Rural urban and gender gaps

Given the heterogeneity in the impacts of the S-system across geographic areas (rural-urban as the differential between estimates based on samples 1 and 2) as well as across gender (samples 3 and 4) there are enough reasons to believe that the impacts of S-system training on the labour income distribution could be disequalizing since the earnings premium appears to configure a sloping ladder. The subsidiary hypothesis is that the S-system promotes, in this order, young heads of household, children, and then (presumably after other household members) women. For example, Table A.3 in the Appendix shows that heads of household aged between 15 and 29 trained in the S-system (in all levels) obtain an average premium in 2007 *reais* of 110 per month in urban areas (14.9%). Children do obtain a small return of almost 24 *reais* per month (3.8%) while women seem on average, to obtain no premium at all.

Since the returns to the accumulation of human capital are not homogeneously distributed amongst groups (gender and urban-rural areas), labour income inequality levels depend on the earning-gap dynamics between these dimensions. In order to investigate this issue, we use quantile regressions to assess the size of the S-system premium across labour income distributions by gender and by urban/rural area.

Figure 1 shows the degree to which the S-system training premium increases the gender labour earnings gap. On the one hand, the premium for men is higher than for women. On the other hand, the premium for women is flat (about 6%) and starting in the last quartile increases, reaching about 15% while the male premium is flat until the second quintile and

then grows reaching about 25% at the upper tail of the distribution. The conclusion is that the S-system contributes to the widening of the labour income distribution trough its enhancing impact on the gender gap.

Contrary to this, the S-system premium contributes to closing the rural-urban labour earnings gap. Figure 2 shows that across almost the whole income distributions, that is, quantile by quantile, there is an extra premium for S-system graduates working in rural areas. It can be argued that this premium is associated with the lack in the supply of skills in low-density areas. This information is also confirmed in Table 5 by comparing the impact of the S-system on labour earnings in samples 2 and 3 (sample 2 considers young individuals at the country level, while sample 3 restricts the computation of the effect to only urban areas). The fact that the impact in sample 3 is smaller across household members than in sample 2 means that the S-system premium in rural areas is larger than the one in urban areas. Thus, regarding the contribution of the S-system to labour income inequality changes, the geographic and gender dimensions work in opposite directions causing the impact of the S-system on labour income inequality is rather ambiguous.

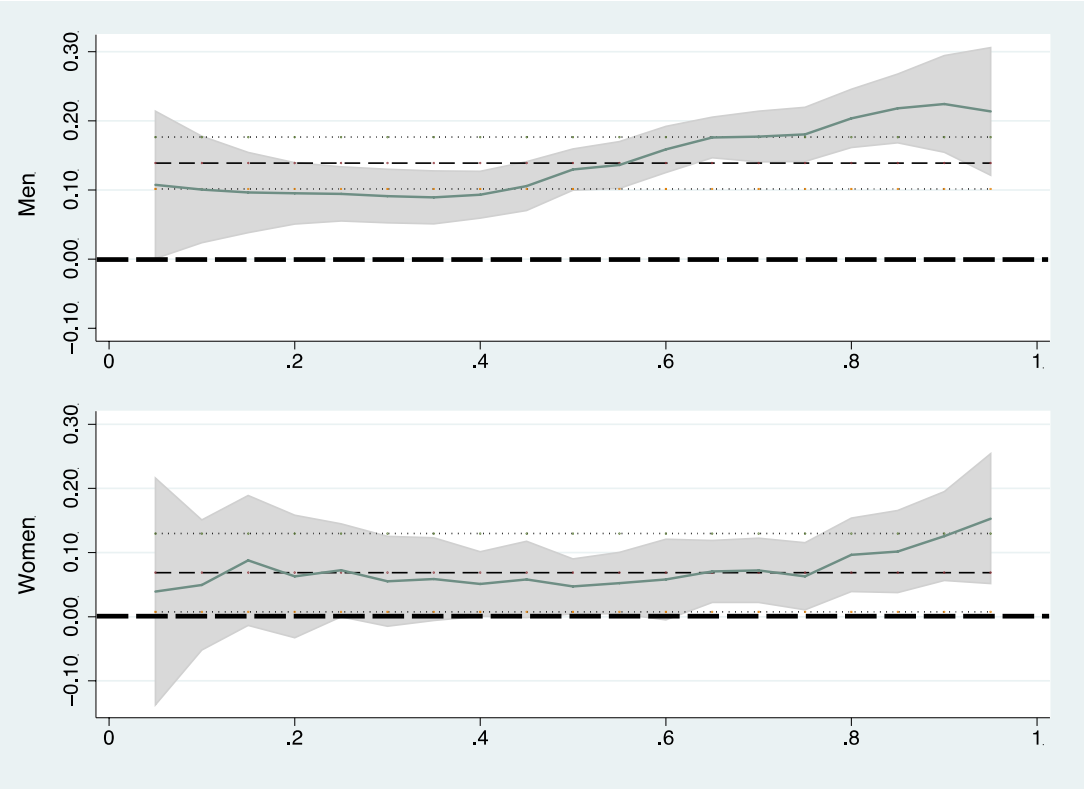

Figure 1: S-system graduates' premium across quantiles of labour earnings, by gender in 2007 (Source: Authors calculations based on PNAD 2007)

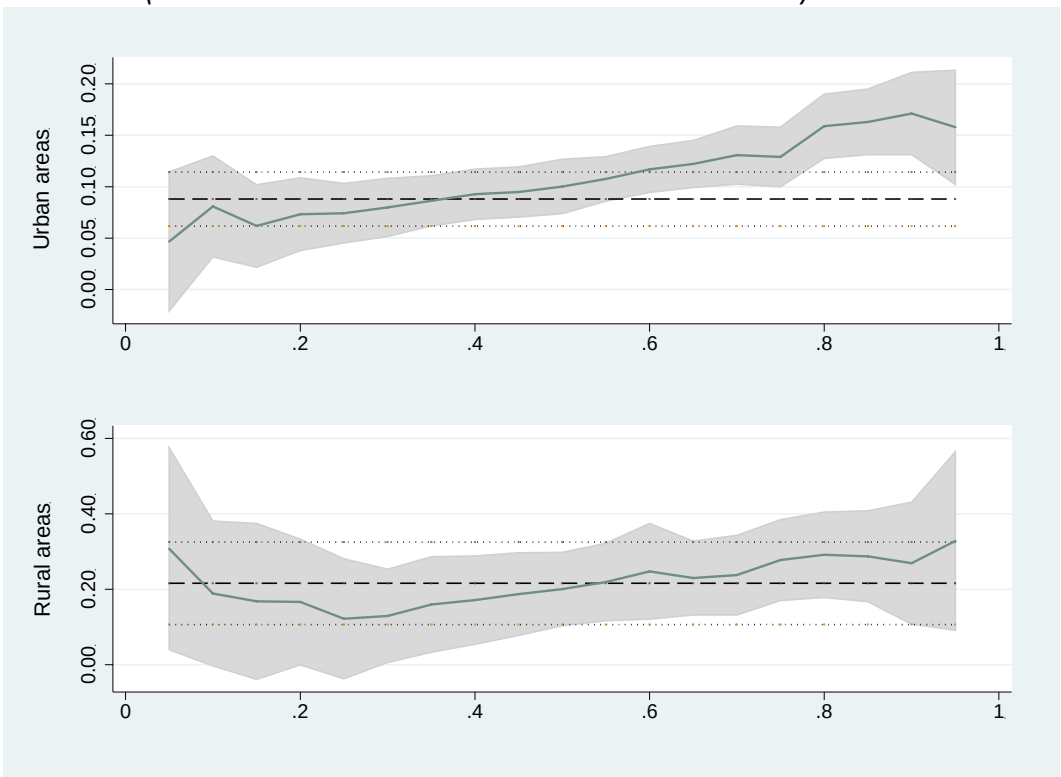

Figure 2: S-system graduates' premium across quantiles of labour earnings, by areas in 2007 (Source: Authors calculations based on PNAD 2007)

5. Mobility and the S-system

The possibility that vocational training could discourage social mobility is one of the most recurrent arguments against the expansion of this type of education (see Goldthorpe and Erikson, 1992; Müller and Pollak, 2005; Shavit and Müller, 1998; Breen and Jonsson, 2007; Müller and Gangl, 2003; Buchmann and Park, 2009). It is argued that vocational training discourages the continuation of studies and therefore contributes to increasing the degree of stratification of the society, however it could also have positive effects on geographical mobility. There is a gap in the literature regarding this unexplored dimension that associates internal migration with vocational training and hence the analysis of social mobility is incomplete if its geographical dimension is missing. In order to address this lack of knowledge, we implement a methodology to see whether graduates of the S-system were more likely to migrate to other states besides their non-trained counterparts. If this is so, losses coming from the occupational segmentation could be partially compensated through gains in geographic mobility.

Empirically, we adopt a similar approach to the one used by Brücker and Trübswetter (2007) in studying the selectivity process associated with the migration of workers between East and West Germany after reunification and the role of wage differentials. Villalobos Barría (2012) similarly investigates the factors constraining internal migration in Chile, while Guilietti et al. (2012) tries to explain the determinants of the self-employment decision of rural-urban migrants in China.

The approach is based on Borjas (1987) who uses the Roy (1951) model to derive a selection model of migration that accounts for unobservables. The main feature of the model is that there is no relationship between the selection process generated by unobserved and observed characteristics.[38]

Borjas (1988) presents a model with random mobility costs.[39] In this model, the wage at the destination lnW_2 and the wage at origin lnW_1 are joint-normally distributed and the migration costs C are not fixed but rather a proportion to home income. Migration occurs if the wage differential is greater than the migration cost ($lnW_2 - lnW_1 > C$), however wages at the origin and destination cannot be observed simultaneously and comparing mean wages yields endogeneity bias. In order to overcome this missing data problem, we employ a three-step strategy to obtain consistent and efficient estimates of the individual probability to migrate and its determinants.[40]

In the first step, a probit reduced-form model for migration serves as the starting point for the estimation, where selectivity corrected wage equations (second step) for migrants and stayers account for the role of unobservable. Finally, in the third step, a structural

[38] The standard Roy model does not consider any switching costs. As a consequence of this, important information is not taken into account if the costs of moving are inversely related to the amounts of human capital (workers' heterogeneity). See Villalobos Barría (2012) and Klasen et al. (2014).

[39] This model is a generalization of the Roy model that relaxes the assumption of constant moving costs by allowing correlation between non-observed abilities and moving costs.

[40] In this study, we avoid the underestimation of the coefficient's standard deviations by accounting for the complex survey design of the PNAD 2007 household survey.

probability model, which properly accounts for earning differentials, explores the structural determinants of migration distinguishing their influence on migration by working through earnings differentials and through other mechanism uncorrelated to it.

Using this framework, it is possible to assess the relationship between the S-system and the wage differential as well as the likelihood that such a vocational training encourages inter-state migration, thus enhancing the mobility prospects of its beneficiaries. Villalobos Barría (2012) presents a detailed description of the estimation procedure, which relies on a switching regression model by Goldfeld and Quandt (1973) with endogenous switching (Maddala and Nelson, 1975; Maddala, 1983).

The migration index function in the first step is estimated using the probit Maximum Likelihood (ML) estimator. In our definition of migration, inter-state movers are individuals who moved anytime within the last four years from one state to another state. The model includes as explanatory variables the level of education of the potential migrant, the potential experience and its square, gender, the number of children older than five in the household (born before migration time span), indigenous status (as above), and controls for the regions at origin. All variables in the reduced form are expected to proxy the characteristics of interest at origin (ex-ante). Based on PNAD 2003, state-level unemployment rates at origin are also included to reflect the hypothesis that unemployment encourages migration outflows. The log of the population at origin aims to control for the availability of public goods.

In the second step, an unbiased and non-endogenous labour earnings differential is calculated and in the third step is included (in logs) together with its square (to allow for nonlinearities) to the structural estimation of the migration probabilities. As explanatory variables, besides the potential wage differential, the structural equation includes the state unemployment rates at origin, the log of the population at origin and the age of the potential migrant as the migration propensity decreases with age (Greenwood 1993). As discussed earlier, of interest is the inclusion of a variable indicating if someone received training in the S-system. Finally, controls for the number of children in the household, the ethnic origin (white, mulatto or others) as well as dummies for the states of origin are considered.

The estimation is based on employed individuals aged between 30 and 40 (age bracket adjacent to the one used to study the school-to-work transition), neither enrolled in any schooling nor training activity, who lived in the country since at least 2002, and without children under the age of five. The age restrictions as well as the non-enrolment conditions are expected to reduce the possibility that someone could migrate in order to enhance the available educational chances as well as to avoid the confounding non-causal correlation that arises from children born after migration. Consequently, it is more likely that the correlation between graduation in the S-system and migration reflects a non-endogenous causality.

Table 8 shows the results of the reduced-form and structural probability models (first and third steps).[41] The reduced form model indicates that migration is more likely amongst the

[41] Selectivity corrected wage equations and the distribution of the potential wage differential are available by the authors upon request.

older individuals within this age bracket, and less likely amongst women. As expected, children born before the migration time span discourage migration, while the ethnic background does not play any role in explaining recent migration. The log of the state population at origin seems to affect the migration probability in the expected direction, although we cannot be sure that the statistical insignificance of this coefficient is due to the multicolinearity associated with the level of aggregation of the variable relative to the number of positive outcomes.

Of more interest are the variables that can influence the migration decision through their impact on labour earnings differentials. The reduced form shows that regarding education, migrants are selected from the upper and lower tail of the distribution. Although statistically insignificant, it is interesting that this selectivity pattern tends to vanish after controlling for the impact that education causes through the earnings differential. Also curious is the fact that the impact of being a S-system graduate does not disappear after controlling for its contribution to the earnings gap (although its impact slightly declines). This means that the impact of the S-system on migration is not driven by the earnings gap caused by the differential returns that the training has in states of origin and destination, but by its contribution to enhancing non-observables such as information, cultural endowments (networks) and the cumulative causation amongst S-system graduates (S-system graduates share specific information that encourages additional migration flows) that strongly determines migration (see Tilly and Brown, 1967; Lomnitz, 1977; Massey, 1990). The structural model confirms the fact that the number of children born before the migration time span contributes to increasing the cost term of the migration utility function (Sjaastad 1962, Becker 1962).

The conclusion is that S-system graduates are, on average, more likely to migrate than their non-trained counterparts. At the country level and based on the same highly restricted non-enrolled employed population (those aged between 30 and 40, without children aged less than 5), the S-system explains, holding everything else constant, the additional migration flow of 82,000 individuals between states which is significant at the 10 percent level. If we allow for unemployment, the “S-system” migration flow rises up to 106,000 individuals.

Generalizations arguing that this type of education unambiguously discourages social mobility should therefore be carefully formulated.

Table 8: Probit model: determinants of inter-state Migration (Reduced form and structural)

Survey: Probit regression	*Dependent variable: recent inter-state migration (Five years time span)*	
	Aged 30-40	
Variables / Model	Reduced	Structural
Earnings differential	-	0.074
	-	(0.109)
Earnings differential – squared	-	-0.136
	-	(0.155)
S-system	0.127*	0.123*
	(0.075)	(0.074)
Age	-0.010*	-0.010
	(0.006)	(0.006)
Incomplete basic education	0.023	0.019
	(0.088)	(0.088)
Complete basic education	-0.062	-0.068
	(0.099)	(0.100)
Incomplete secondary education	-0.119	-0.136
	(0.124)	(0.127)
Complete secondary education	-0.103	-0.106
	(0.096)	(0.096)
Incomplete secondary education	-0.020	-0.020
	(0.144)	(0.144)
Complete secondary education	0.088	0.064
	(0.101)	(0.111)
Average household education	0.006	0.008
	(0.009)	(0.009)
Female	-0.113***	-0.092**
	(0.037)	(0.045)
Children older than 5	-0.135***	-0.136***
	(0.021)	(0.021)
Ethnicity 1 (*white*)	0.022	0.033
	(0.070)	(0.074)
Ethnicity 2 (*mulatto*)	0.067	0.080
	(0.068)	(0.069)
Unemployment rates at origin (state level)	-0.033*	0.037***
	(0.020)	(0.014)
Log of the state population at origin	-0.090	-0.034
	(0.056)	(0.091)
Constant	0.526	-2.092
	(1.211)	(1.396)
Federal Unit controls at origin	Yes	Yes
Observations	29871	29871
Population size	13962307	13962307
F	5.164	4.064
Prob > F	0.000	0.0000

Excluded categories: no education, agriculture, managing directors and CEOs, men, other ethnic backgrounds.

Source: Own calculations based on PNAD 2007.

6. Shifts in the demand for labour and income inequality

So far we have demonstrated the SENAI system can offer substantial labour market returns to participants. At the same time, it is useful to relate these findings to more general trends in the Brazilian labour market. In particular, can SENAI contribute to explaining the fact that the Brazilian economy was able to reduce general and youth unemployment from 12.4 and 25.3 percent in 2003 to 5.4 and 13.7 percent in 2012 respectively?[42] What is the role of the SENAI in this, in the words of Amann (2011), second Brazilian miracle? And what is the impact of the SENAI training on changes in income inequality, particularly the substantial decline in income inequality since the mid-1990s in Brazil? Our empirical analysis suggests that the SENAI has contributed to this story of success by providing valuable skills to the labour force. However, the links to inequality reduction are not straightforward.[43] Firstly, the contribution of the SENAI in shaping the skill's endowment is somewhat ambiguous. As of 2007, one fifth of the S-system trained population had less than a basic education, while about 50% achieved at least a secondary education (see Table 2 above). Secondly, given the idea that the expansion of education is a continuous, cumulative and highly persistent process, we argue that labour and educational supply factors can hardly explain pronounced inequality changes over relatively short periods of time. Instead, there is evidence that shifts in the demand for labour plays a prominent role in explaining inequality dynamics in Brazil. For instance, starting in the 1970s, a shift in the labour demand away from low-skilled occupations caused relative wages for less-educated individuals to decline and labour income inequality to rise, as they were unable to move towards the capital intensive growing sectors (see Cimoli and Katz, 2002). More recently, the change in the labour demand favouring less-skilled individuals may explain the apparent paradox of low unemployment rates and low, however improving, achievements in education as well as the sharp decline in labour income inequality (see Barros et al. 2010; Schwartzman and Christophe, 2005; Schwartzman and de Moura Castro, 2013).[44]

Recent literature suggests that demand shifts may account for a substantial part of the observed distributional changes in the household income distribution. For instance, Klasen et al. (2014) offer a plausible explanation of the inequality dynamics in Honduras over the period 1990-2007. Thus, the same transmission mechanisms appear to be plausible candidates to explain the linkages between demand shift and income inequality. Although it is unlikely that the SENAI could have played a central role in determining inequality trends, it is likely that the SENAI improves labour mobility and thus, reduces the potential disequalizing shifts in labour demand. Klasen et al. (2014) and Villalobos Barría (2012) argued that shifts away from the traditional (less-skilled) sector together with an immobile

[42] See Banco Central Do Brasil (2013) and ILO (2013) for total and youth unemployment figures respectively.

[43] According to Barros et al. (2010) the fall in labour income inequality explains about half of the decline in overall income inequality (household per capita income) during the 2001-2007 period. The authors argue that an accelerated expansion of education and declining returns to education largely account for the observed declining household income inequality trend.

[44] Schwartzman and de Moura Castro (2013) argue that job creation mainly responds to an increasing demand for low-skilled workers in the service sector. Schwartzman and Christophe (2005) argue that new technologies tend to favour two groups: One group providing standardized services that requires a low level of skills, and another group supplying non-standardized services, such as sale, and other activities that demand a higher level of skills.

working force might result in a strong disequalization of the labour incomes while increasing informality (see also Soares et al., 2003).

7. Conclusion

With the challenges of skills shortages, substantial youth unemployment, and a demographic bulge in Sub-Saharan African countries in mind, the main purpose of this paper has been to understand the determinants of participation in Brazil's S-system (mainly SENAI) as well as a thorough examination of the measurable consequences of S-system participation on facilitating the school-to-work transition.

This study has provided an overview of potential and limitations of the S-system of vocational training system in Brazil. Our impact evaluation suggests that the weaknesses of the S-system originate from the same source that makes it effective. The search for matching supply and demand and its decentralised framework determines that the institution can be as good as the local employers' associations are.

Our analysis, based in five different models, sheds some light on the dimensions that need to be taken into consideration when evaluating such a complex and decentralised institution. These dimensions are all important and worth considering (without a hierarchic order) in Africa independently of the country-specific context.

In the racial dimension, policymakers have to ensure that any intervention to create or modify the vocational training system needs to be oriented around offering each ethnic group the same development chances. In the financing dimension, the focus should be on finding the proper structure that avoids fluctuations and uncertainties. In the productivity dimension, the emphasis has to be on improving labour market outcomes. In the social mobility dimension, the set of interventions has to be oriented around reducing the segmentation in occupations, in particular towards low-skilled activities and in promoting new chances of internal migration. In the gender dimension, efforts have to be devoted to fighting discrimination promoting disadvantaged groups. Finally, in the geographic dimension, the system has to cover the whole country, promoting a reduction in the speed of urbanization and the formation of overpopulated cities surrounded by violence and low standards of living.

The sustainability of the S-system and of the SENAI lies on its good performance in most dimensions. In this study we did not find any signal of ethnic inequality caused by the S-system. The financing schema proved to balance a market driven component with a stable public funding. Regarding the geographic dimension, the S-system is present in the 27 states of the country, and the region of residence does almost not affect the enrolment probability.

The gender and social mobility dimensions are the spaces where the S-system and the SENAI in particular could have done more over the past decades. It is not clear that the male bias of the S-system is exclusively a demand driven issue. In the same way, although the S-system encourages geographical mobility, this is not sufficient to meeting the needs of the poor or to encourage the social mobility of the disadvantaged. It will probably be argued that such

challenges are not specific to the S-system. The worldwide leadership of the system imposes the responsibility to innovate in both dimensions as the system represents the model to follow in Africa.

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APPENDIX

Table A.1: Probability model for the enrolment in a technical or technological training course, 2007

Survey: Probit regression	Dependent variable: enrolment in a technical and technological training course, by type of institution					
Population	Sample 1		Sample 2		Sample 3	
Variables / Type of institution	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
Age	-0.007***	-0.013***	-0.029***	-0.032***	-0.030***	-0.032***
Incomplete basic	0.260**	0.369***	0.200	0.368***	0.141	0.416***
Complete basic	0.747***	0.746***	0.501**	0.717***	0.452**	0.730***
Incomplete secondary	0.911***	0.921***	0.777***	0.903***	0.716***	0.891***
Complete secondary	0.940***	1.036***	0.861***	1.102***	0.799***	1.055***
Incomplete tertiary	0.490***	0.569***	0.353*	0.594***	0.279	0.594***
Complete tertiary	0.611***	0.802***	0.331	0.873***	0.272	0.837***
Children x father's educ. (T)	-0.320***	-0.110**	-0.397***	-0.196***	-0.399***	-0.198***
Avg. household education	0.016**	0.012***	0.022**	0.006	0.008	-0.002
Female	-0.203***	0.073***	-0.308***	0.029	-0.324***	0.020
Ethnic I (white)	-0.035	-0.037	-0.066	-0.036	-0.052	-0.043
Ethnic II (mulatto)	-0.003	-0.024	0.010	0.003	0.018	0.010
Bi-parental household	0.096**	0.024	0.132***	0.045*	0.143***	0.061**
Spouse	-0.085	-0.051*	-0.140	-0.050	-0.115	-0.055
Children	0.050	0.077***	-0.028	0.054	0.005	0.066
Other household member	-0.028	0.021	-0.120	-0.011	-0.088	-0.017
Household size	-0.035***	-0.037***	-0.048***	-0.034***	-0.044***	-0.030***
Female x children under 5	0.058	-0.099***	0.083	-0.115**	0.020	-0.112**
Northeast	-0.050	0.053	0.005	0.047	0.012	0.058
Southeast	0.041	0.207***	0.122	0.168***	0.103	0.166***
South	0.163	0.232***	0.184*	0.175***	0.182	0.170***
Midwest	0.055	0.075	0.106	0.048	0.038	0.016
Enrolled in school system	0.060	0.288***	0.043	0.245***	0.020	0.215***
Employed	0.137	-0.293***	0.111	-0.477***	0.071	-0.575***
Interactions with employed						
Formal	0.133***	-0.081***	0.224***	-0.073**	0.245***	-0.066*
Union membership	0.037	0.117***	0.072	0.147***	0.071	0.159***
Hours of work	-0.002***	-0.001***	-0.003***	-0.001***	-0.004***	-0.001***
Industrial activities	0.033	0.309***	-0.003	0.555***	-0.190	0.566***
Manufacturing	0.107**	0.129***	0.068	0.114***	0.064	0.111***
Public administration	-0.025	0.078*	-0.105	0.039	-0.096	0.012
Education and health	0.061	0.154***	-0.070	0.130***	-0.043	0.115**
Other Services	0.172**	0.150***	0.008	0.117*	0.018	0.131**
Managers	0.078	0.387***	0.180	0.403***	0.264	0.495***
Professionals	0.027	0.441***	0.248	0.601***	0.323	0.688***
Technicians	0.168	0.538***	0.431**	0.652***	0.514*	0.730***
Clerks	0.120	0.423***	0.289*	0.593***	0.369	0.671***
Service workers	0.196**	0.459***	0.339**	0.610***	0.413	0.660***
Craft and trade workers	0.243**	0.433***	0.484***	0.570***	0.549**	0.630***
Operators	0.275***	0.318***	0.360**	0.416***	0.425	0.466***
Constant	-2.985***	-2.318***	-2.316***	-1.810***	-2.137***	-1.738***
Observations	174872	180305	67046	70351	54798	57747
Population	83282219	85990337	31161384	32768719	25145643	26567877
Design df	5455	5493	4999	5040	4658	4691
F-statistic	18.276	82.743	10.278	40.617	8.717	27.284
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Number of Strata	637	699	627	649	592	592
Number of PSU	6092	6192	5626	5689	5250	5283

Excluded Categories: Male, other ethnic groups, heads of household, and northern region, non-enrolled, unemployed.
Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).
Source: Author's calculation based on PNAD 2007 data. * p<.10, ** p<.05, *** p<.01

Table A.2: Probability model for the enrolment in a professional qualification training course, 2007

Survey: Probit regression	Dependent variable: enrolment in a professional qualification training course, by type of institution					
Population	Sample 1		Sample 2		Sample 3	
Variables / Type of institution	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
Age	-0.014***	-0.014***	-0.039***	-0.023***	-0.037***	-0.023***
Years of schooling	0.094***	0.116***	0.085***	0.082***	0.081***	0.072***
Children x father's educ. (T)	-0.466**	-0.245***	-0.743**	-0.243***	-0.716**	-0.225***
Avg. household education	0.019*	0.016***	0.011	0.031***	-0.001	0.028***
Female	-0.297***	0.009	-0.366***	0.007	-0.339***	-0.000
Ethnic I (white)	-0.004	-0.108***	-0.006	-0.101**	-0.011	-0.095**
Ethnic II (mulatto)	-0.088	-0.068*	-0.038	-0.082*	-0.045	-0.076
Bi-parental household	0.093	-0.012	0.101	0.007	0.158**	0.017
Spouse	0.003	-0.076**	0.178	-0.037	0.163	-0.053
Children	0.260***	0.106***	0.321***	0.171***	0.353***	0.175***
Other household member	0.167	-0.046	0.142	0.002	0.198	0.005
Household size	-0.071***	-0.026***	-0.087***	-0.042***	-0.095***	-0.047***
Female x children under 5	0.186	-0.017	0.195	-0.077	0.204	-0.048
Northeast	-0.182	-0.019	-0.112	0.016	0.037	0.058
Southeast	0.068	0.127***	0.201	0.195***	0.306**	0.216***
South	0.069	0.188***	0.174	0.251***	0.271**	0.258***
Midwest	0.054	-0.114**	0.152	-0.147**	0.210	-0.124*
Enrolled in school system	-0.084	0.147***	-0.082	0.062*	-0.075	0.059*
Employed	-0.023	-0.345***	0.132	-0.605***	-0.052	-0.580*
Interactions with employed						
Formal	0.137**	-0.011	0.255***	0.033	0.284***	0.043
Union membership	-0.043	0.018	0.064	0.001	0.048	0.021
Hours of work	-0.001	-0.000	-0.003***	-0.000	-0.003***	-0.000
Industrial activities	0.454**	0.473***	0.000	0.604***	0.000	0.577***
Manufacturing	0.259***	0.184***	0.334***	0.185***	0.295***	0.160***
Public administration	-0.049	0.099*	-0.279	0.102	-0.338	0.069
Education and health	0.177	0.163***	0.243	0.200***	-	0.164**
Other Services	0.104	0.038	0.105	0.053	-	0.041
Managers	-0.142	0.162	-0.147	0.364	-	0.343
Professionals	-0.443*	-0.047	-0.348	0.242	-	0.242
Technicians	0.078	0.496***	-0.001	0.669***	0.314	0.622*
Clerks	-0.001	0.391***	-0.011	0.624***	0.235	0.614*
Service workers	0.123	0.419***	0.096	0.560***	0.349*	0.526*
Craft and trade workers	0.073	0.307**	0.205	0.473**	0.419**	0.397
Operators	0.223	0.284**	0.199	0.463**	0.438**	0.425
Constant	-3.565***	-3.297***	-2.940***	-2.714***	-2.987***	-2.578***
Observations	320884	322613	100313	101868	82985	84368
Population	151363832	152216286	46216520	46971071	37747149	38412456
Design df	6001	6032	5415	5430	5017	5025
F-statistic	35.202	130.673	16.292	50.004	12.729	34.919
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Number of Strata	682	753	667	695	629	628
Number of PSU	6683	6785	6082	6125	5646	5653

Excluded Categories: Male, other ethnic groups, heads of household, and northern region, non-enrolled, unemployed.
Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).

Source: Author's calculation based on PNAD 2007 data. * p<.10, ** p<.05, *** p<.01

Table A.3: IPW average treatment effects of vocational training on labour monthly earnings by institution, household position and aggregation samples (1-4), Reais of 2007 and percentages over non-trained individuals.

		Whole		Heads		Children	
Professional qualification	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	68	117	99	179	32	67
	Sample 2	157	52	257	50	23	60
	Sample 3	84	40	120	47	0	37
	Sample 4	-17	16	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	8.0	13.6	9.8	17.5	4.9	10.2
	Sample 2	26.5	8.7	38.2	7.3	4.0	10.3
	Sample 3	13.2	6.3	16.3	6.4	0.0	5.9
	Sample 4	-2.9	2.6	-	-	-	-
Technical and Technological levels		Whole		Heads		Children	
	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	65	86	148	71	158	116
	Sample 2	235	105	303	160	126	83
	Sample 3	104	106	40	175	143	77
	Sample 4	106	18	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	7.4	8.9	13.9	6.0	23.7	16.4
	Sample 2	38.8	16.1	44.0	20.9	21.5	13.3
	Sample 3	15.9	15.4	5.3	21.1	22.7	11.7
	Sample 4	17.8	2.8	-	-	-	-
All levels		Whole		Heads		Children	
	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	68	109	104	149	52	79
	Sample 2	168	63	262	72	40	65
	Sample 3	87	54	110	73	24	46
	Sample 4	0	16	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	7.9	12.2	10.3	13.9	7.9	11.8
	Sample 2	28.3	10.4	38.9	10.3	6.9	11.0
	Sample 3	13.7	8.4	14.9	9.7	3.8	7.3
	Sample 4	0.0	2.7	-	-	-	-

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).

Table A.4: IPW average treatment effects of vocational training on monthly working hourks by institution, household position and aggregation samples (1-4), hours and percentages over non-trained individuals.

		Whole		Heads		Children	
Professional qualification	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.6	2.4	2.6	4.4	0.9	3.5
	Sample 2	-1.1	2.9	-3.6	2.9	2.7	3.5
	Sample 3	-1.3	2.5	-2.7	0.9	-2.8	2.8
	Sample 4	-2.3	2.7	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.3	1.3	1.4	2.3	0.5	1.9
	Sample 2	-0.6	1.6	-1.9	1.5	1.5	1.9
	Sample 3	-0.7	1.4	-1.4	0.5	-1.5	1.5
	Sample 4	-1.4	1.6	-	-	-	-
Technical and Technological levels		Whole		Heads		Children	
	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	-1.3	-0.3	2.6	1.7	3.1	-2.4
	Sample 2	-0.8	-1.2	-5.3	0.0	-0.9	-0.4
	Sample 3	4.6	-1.5	-5.4	-2.0	4.7	0.1
	Sample 4	12.7	-0.3	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	-0.7	-0.2	1.4	0.9	1.7	-1.3
	Sample 2	-0.4	-0.7	-2.7	0.0	-0.5	-0.2
	Sample 3	2.5	-0.8	-2.8	-1.1	2.6	0.0
	Sample 4	7.5	-0.2	-	-	-	-
All levels		Whole		Heads		Children	
	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.4	1.7	2.6	3.6	1.2	2.0
	Sample 2	-1.1	2.0	-3.8	2.3	2.1	2.6
	Sample 3	-0.4	1.6	-3.0	0.3	-1.5	2.2
	Sample 4	-0.2	2.0	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.2	0.9	1.4	1.9	0.7	1.1
	Sample 2	-0.6	1.1	-2.0	1.2	1.2	1.4
	Sample 3	-0.2	0.9	-1.6	0.2	-0.8	1.2
	Sample 4	-0.1	1.2	-	-	-	-

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).

Table A.5: IPW average treatment effects of vocational training on hourly wages by institution, household position and aggregation samples (1-4), Reais of 2007 and percentages over non-trained individuals.

		Whole		Heads		Children	
Professional qualification	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.34	0.59	0.46	0.73	0.45	0.25
	Sample 2	0.84	0.24	1.59	0.20	-0.22	0.21
	Sample 3	0.28	0.11	0.69	0.22	-0.34	-0.02
	Sample 4	-0.22	-0.01	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	6.3	10.6	7.4	11.4	10.6	5.7
	Sample 2	22.4	6.3	41.4	5.1	-5.8	5.4
	Sample 3	7.1	2.7	16.4	5.3	-8.4	-0.5
	Sample 4	-5.2	-0.3	-	-	-	-
		Whole		Heads		Children	
Technical and Technological levels	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.02	0.64	0.47	0.17	1.09	1.30
	Sample 2	1.01	0.77	1.68	1.67	0.54	0.54
	Sample 3	0.14	0.75	0.18	1.97	0.38	0.48
	Sample 4	-0.34	-0.05	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.3	10.2	7.1	2.3	25.3	28.0
	Sample 2	26.6	18.5	42.9	38.3	14.2	13.0
	Sample 3	3.4	17.1	4.1	41.8	9.1	10.8
	Sample 4	-7.8	-1.0	-	-	-	-
		Whole		Heads		Children	
All levels	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.30	0.60	0.46	0.57	0.55	0.51
	Sample 2	0.86	0.35	1.60	0.49	-0.09	0.28
	Sample 3	0.26	0.25	0.62	0.58	-0.22	0.09
	Sample 4	-0.23	-0.02	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	5.5	10.5	7.3	8.5	13.0	11.6
	Sample 2	23.1	9.0	41.6	12.4	-2.4	7.1
	Sample 3	6.5	6.0	14.8	13.4	-5.4	2.1
	Sample 4	-5.5	-0.5	-	-	-	-

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).

Table A.6: IPW average treatment effects of vocational training on formality likelihood by institution, household position and aggregation samples (1-4), percentage points and percentages over non-trained individuals.

		Whole		Heads		Children	
Professional qualification	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.09	0.08	0.10	0.07	0.09	0.12
	Sample 2	0.09	0.10	0.06	0.10	0.09	0.12
	Sample 3	0.06	0.08	0.03	0.10	0.08	0.09
	Sample 4	-0.05	0.03	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	16.2	13.4	17.6	12.4	16.8	20.8
	Sample 2	16.1	17.4	11.3	17.7	17.6	22.0
	Sample 3	9.6	13.9	4.9	17.6	13.4	15.7
	Sample 4	-8.1	4.4	-	-	-	-
Technical and Technological levels		Whole		Heads		Children	
	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.08	0.08	0.12	0.07	0.06	0.11
	Sample 2	0.09	0.08	0.07	0.09	0.08	0.10
	Sample 3	0.07	0.07	0.04	0.10	0.14	0.08
	Sample 4	0.56	0.07	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	14.4	12.5	19.5	11.0	10.5	18.9
	Sample 2	16.5	13.7	13.3	15.1	15.2	15.9
	Sample 3	11.4	11.6	6.1	15.7	23.0	-4.9
	Sample 4	76.8	11.2	-	-	-	-
All levels		Whole		Heads		Children	
	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.09	0.08	0.10	0.07	0.09	0.12
	Sample 2	0.09	0.09	0.06	0.10	0.09	0.12
	Sample 3	0.06	0.08	0.03	0.10	0.09	0.09
	Sample 4	-0.03	0.04	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	16.0	13.2	17.8	12.0	15.8	20.3
	Sample 2	16.1	16.6	11.6	17.2	17.2	20.6
	Sample 3	9.9	13.4	5.1	17.2	15.0	15.1
	Sample 4	6.0	6.0	-	-	-	-

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).

Table A.7: IPW average treatment effects of vocational training on employment probability by institution, household position and aggregation samples (1-4), percentage points and percentages over non-trained individuals.

		Whole		Heads		Children	
Professional qualification	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.10	0.10	0.07	0.04	0.03	0.08
	Sample 2	0.07	0.09	0.03	0.02	0.01	0.07
	Sample 3	0.07	0.06	0.01	0.02	0.07	0.05
	Sample 4	0.10	0.09	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	17.3	17.3	10.2	5.3	4.6	13.5
	Sample 2	12.3	14.6	3.2	2.5	1.9	12.1
	Sample 3	11.2	9.4	1.0	2.5	11.4	7.4
	Sample 4	20.4	17.1	-	-	-	-
Technical and Technological levels		Whole		Heads		Children	
	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.10	0.12	0.09	0.05	0.08	0.08
	Sample 2	0.07	0.09	0.03	0.02	0.04	0.09
	Sample 3	0.04	0.08	-0.02	0.02	0.04	0.07
	Sample 4	0.02	0.10	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	16.9	20.0	12.9	6.8	13.8	13.8
	Sample 2	12.2	15.5	3.0	2.8	6.4	14.3
	Sample 3	7.0	12.1	-2.1	2.2	7.0	-3.7
	Sample 4	3.1	19.0	-	-	-	-
All levels		Whole		Heads		Children	
	Absolute effect	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	0.10	0.10	0.07	0.04	0.03	0.08
	Sample 2	0.07	0.09	0.03	0.02	0.02	0.07
	Sample 3	0.07	0.06	0.01	0.02	0.07	0.05
	Sample 4	0.09	0.09	-	-	-	-
		Whole		Heads		Children	
	Relative effect (%)	S-system	Other institutions	S-system	Other institutions	S-system	Other institutions
	Sample 1	17.3	18.1	10.5	5.7	6.1	13.6
	Sample 2	12.3	14.7	3.2	2.5	2.7	12.6
	Sample 3	10.5	10.0	0.6	2.4	10.7	8.3
	Sample 4	17.6	17.6	-	-	-	-

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).

Table A.8: IPW average treatment effects of S-system vocational training on the probability of being employment in the same area of training, by household position and aggregation samples (1-4), percentage points and percentages over trained individuals in other institutions.

Professional qualification		Whole	Heads	Children
	Absolute effect	S-system over other vocational training institutions		
	Sample 1	0.07	0.04	0.10
	Sample 2	0.12	0.09	0.12
	Sample 3	0.13	0.09	0.12
	Sample 4	0.13	-	-
		Whole	Heads	Children
	Relative effect (%)	S-system over other vocational training institutions		
	Sample 1	13.4	6.8	28.0
	Sample 2	34.8	18.3	35.6
	Sample 3	36.5	18.0	36.6
	Sample 4	40.0	-	-
Technical and Technological levels		Whole	Heads	Children
	Absolute effect	S-system over other vocational training institutions		
	Sample 1	0.12	0.07	0.10
	Sample 2	0.09	-0.08	0.07
	Sample 3	0.09	-0.06	0.06
	Sample 4	-0.05	-	-
		Whole	Heads	Children
	Relative effect (%)	S-system over other vocational training institutions		
	Sample 1	23.2	12.4	20.7
	Sample 2	18.1	-14.9	14.6
	Sample 3	18.2	-11.9	12.8
	Sample 4	-11.3	-	-
All levels		Whole	Heads	Children
	Absolute effect	S-system over other vocational training institutions		
	Sample 1	0.08	0.07	0.10
	Sample 2	0.11	0.07	0.10
	Sample 3	0.12	0.07	0.10
	Sample 4	0.12	-	-
		Whole	Heads	Children
	Relative effect (%)	S-system over other vocational training institutions		
	Sample 1	15.9	11.3	25.1
	Sample 2	30.8	15.2	28.7
	Sample 3	32.0	15.4	29.1
	Sample 4	33.2	-	-

Source: Authors calculations based on PNAD 2007.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).

Table A.9: Heckman estimation of selectivity corrected monthly labour earnings and the impact of the S-system

Outcome: log labour earnings	Outcome Equations				Selection Equations			
Variables	Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4
Incomplete basic ed.	0.205***	-0.011	0.179***	0.181*	0.180***	0.547***	0.735***	0.519***
	(0.016)	(0.040)	(0.046)	(0.097)	(0.019)	(0.040)	(0.051)	(0.082)
Complete basic ed.	0.421***	0.149***	0.424***	0.425***	0.316***	0.819***	1.059***	0.875***
	(0.018)	(0.050)	(0.049)	(0.104)	(0.024)	(0.047)	(0.058)	(0.091)
Incomplete secondary ed.	0.503***	0.193***	0.501***	0.556***	0.421***	0.983***	1.203***	0.939***
	(0.021)	(0.054)	(0.051)	(0.105)	(0.029)	(0.051)	(0.061)	(0.094)
Complete secondary ed.	0.626***	0.253***	0.623***	0.636***	0.558***	1.190***	1.416***	1.262***
	(0.019)	(0.056)	(0.050)	(0.104)	(0.023)	(0.047)	(0.056)	(0.087)
Incomplete secondary ed.	0.925***	0.513***	0.941***	0.965***	0.663***	1.437***	1.601***	1.499***
	(0.031)	(0.071)	(0.064)	(0.119)	(0.050)	(0.090)	(0.097)	(0.145)
Complete secondary ed.	1.311***	0.807***	1.311***	1.287***	0.939***	1.919***	2.045***	1.856***
	(0.027)	(0.071)	(0.059)	(0.114)	(0.033)	(0.064)	(0.070)	(0.102)
Average household ed.	0.034***	0.036***	0.027***	0.033***	-0.016***	-0.031***	-0.034***	0.002
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.004)	(0.005)	(0.007)
S-system	**0.093*** **	**0.088*** **	**0.106*** **	**0.061** **	**0.101*** **	**0.129*** **	**0.127** **	**0.183*** **
	(0.014)	(0.023)	(0.021)	(0.031)	(0.030)	(0.049)	(0.053)	(0.058)
S-system x FEMALE	**-0.013**	**-0.081***	**-0.035**	-	**0.199*** **	**0.135***	**0.104**	-
	(0.025)	(0.042)	(0.036)	-	(0.044)	(0.073)	(0.078)	-
Potential experience	0.037***	0.046***	0.065***	0.061***	0.047***	0.075***	0.079***	0.075***
	(0.001)	(0.004)	(0.004)	(0.007)	(0.001)	(0.006)	(0.007)	(0.010)
Potential experience (sq.)	-0.001***	-0.001***	-0.002***	-0.002***	-0.001***	-0.001***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Union Membership	-0.077***	-0.086***	-0.097***	-0.083***	-	-	-	-
	(0.006)	(0.010)	(0.009)	(0.016)	-	-	-	-
Women	**-0.455*** **	**-0.095*** **	**-0.274*** **	**-**	**-0.902*** **	**-0.809*** **	**-0.768*** **	**-**
	(0.010)	(0.026)	(0.017)	-	(0.013)	(0.022)	(0.021)	-
Children in household (n)	-0.012***	-0.018***	-0.022***	-0.030***	0.012***	-0.025***	-0.027***	-0.045***
	(0.003)	(0.005)	(0.005)	(0.009)	(0.004)	(0.007)	(0.009)	(0.013)
Bi-parental household	-	-	-	-	-0.018	0.016	0.025	-0.168***
	-	-	-	-	(0.013)	(0.018)	(0.023)	(0.032)
Ethnicity 1 (*white*)	0.096***	0.051***	0.049***	0.022	-0.071***	-0.027	-0.001	0.040
	(0.011)	(0.018)	(0.017)	(0.031)	(0.022)	(0.032)	(0.035)	(0.049)
Ethnicity 2 (*mulatto*)	-0.006	0.007	-0.018	-0.048	-0.051**	-0.056*	-0.067**	-0.068
	(0.011)	(0.017)	(0.017)	(0.032)	(0.021)	(0.030)	(0.033)	(0.047)
Rural	-0.126***	-0.022	-	-	-0.166***	-0.339***	-	-
	(0.016)	(0.023)	-	-	(0.019)	(0.027)	-	-
Inverse Mill's ratio	0.009	-0.478***	-0.161	0.023	-	-	-	-
	(0.011)	(0.044)	(0.025)	(0.038)	-	-	-	-
Constant	6.126***	6.576***	6.025***	5.942***	0.237***	-0.409***	-0.608***	-1.152***
	(0.050)	(0.108)	(0.100)	(0.194)	(0.033)	(0.061)	(0.071)	(0.106)
Occupation controls	Yes				No			
Sectoral controls	Yes				No			
State controls	Yes				Yes			
Observations	98077	33027	25788	12235	98077	33027	25788	12235
Population size	47670593	15548981	11988426	5685453	47670593	15548981	11988426	5685453
Censored population	20,703,397	6,430,786	4,492,326	2,859,725	20,703,397	6,430,786	4,492,326	2,859,725
F	467.92	98.098	122.04	59.50	467.92	98.098	122.04	59.50
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Note: Based on sample 1 (whole population aged over 10 years). Excluded categories: no education, agriculture, managing directors and CEOs, other ethnic backgrounds.

Note: Samples (1) consist of individuals aged + 10. Sample (2) is (1) aged between 15 and 29. Sample (3) is sample (2) in urban areas. Sample (4) corresponds to women of (3).

Source: Own calculations based on PNAD 2007

Quantile Regression Methodology

Consider the following distribution function from a random variable Y

$$F(y) = \Pr(Y \leq y) \quad (1)$$

For any $\tau\epsilon(0,1)$ the quantile of Y is defined as:

$$Q(\tau) = inf\{y: F(y) \geq \tau\} \quad (2)$$

The quantile function gives a complete characterization of Y. *Q*(0.5) is the median, the first quartile is *Q*(0.25), the first decile is *Q*(0.1) and so on. We can now write it in a different way. Let $x_i, i = 1, \dots, n$ a $(K \times 1)$ vector of explanatory variables, then:

$$F_{u\tau}(\tau - x_i'\beta_\tau | x_i) = Pr(y_i \leq \tau | x_i) \quad (3)$$

This equation is equivalent to:

$$Y_i = x_i'\beta_\tau + u_{\tau i} \quad (4)$$

Where the only constraint is that $Q_\tau(u_{\tau i}|x_i) = 0$ and the distribution of this error term left unspecified. From this we now write the linear conditional quantile function as:

$$Q_\tau(\tau|X = x) = x_i'\beta_\tau \quad (5)$$

Where β_τ can be estimated solving:

$$\beta_\tau = arg \min_{\beta\epsilon R^k} \sum_{i=1}^{n} \rho_\tau(y_{i-} x_i'\beta_\tau) \quad (6)$$

Where $\rho_\tau(u) = u\big(\rho_\tau - I(u < 0)\big)$ is the piecewise linear "check function" and $I(\,)$ is the indicator function. The quantile regression estimator achieves a more complete description of the conditional distribution of Ygiven $X = x$. The partial derivate of the conditional quantile of y with respect to one of the regressors, *j-th*, could be interpreted as the marginal change in the $\tau - th$ quantile due to a marginal change in the *j-th* regressor. Note, that this marginal effect is related with τ and not with some particular individual, which changes their $\tau - th$ quantile simultaneously when some value of their explanatory variable changes.

There is a major advantage using Quantile regression. It can detect and deal with the plausible heteroskedasticity, as it is present in the Brazilian data allowing different slopes for each conditional quantile in the wage distribution. Using the method suggested by Koenker and Bassett (1978, 1982) to obtain the standard errors, Rogers (1992) reports that these standard errors are suitable in the homoskedastic case but that they look to be understated in the presence of heteroskedastic errors.

The median regression is also more robust than an OLS regression in presence of outliers and a difference of Heckman ML estimators, it does not rely on the normality of the residuals because the estimation is only influenced by the local behaviour of the conditional distribution near the specified quantile.