Brazil underwent a large trade liberalization process in the 1990’s. Over the period, manufacturing employment decreased significantly, generating public debate on the need to revert liberalization. This paper aims to identify the actual effect of trade liberalization on employment, separating it from exchange rate movements using a gross job flow approach. Our novel data set covers all sectors and formally registered enterprises and we use new sector specific exchange rate data. Our estimates suggest that greater openness reduce jobs through increased job destruction, with no effect on job creation. But the exchange rate matters also. Depreciations expand the number of jobs in manufacturing by increasing creation, with no effect on destruction.

Key words: trade liberalization; exchange rate; gross job flows; Brazil
INTRODUCTION

Over the 1990’s, Latin American countries, including Brazil, underwent a series of structural reforms aimed at improving the economic conditions after a decade of stagnation. Among the reforms, trade liberalization was particularly important and profound (IADB, 1997). Looking at the case of Brazil, the largest economy in South America, tariffs decreased five fold from 1986 to 1995, while import penetration doubled over the decade. At the same time, from 1994 to 1998, the Real stabilization plan imposed a fixed exchange rate that was seen as significantly appreciated. There were important effects on employment. Manufacturing employment shrank 10% over the decade, leaving thousands of workers without jobs. Some experts have blamed trade liberalization as the culprit of joblessness. The strong echoes in the political arena have led to the proposition to revert the liberalization process. Yet, in the two years following the strong devaluation of the Brazilian currency in 1999, about half of the jobs lost in the previous eight years were recovered. This raises the question of whether trade liberalization or the exchange rate, or both international factors can be associated with employment changes.

The goal of this article is to study the effect of one of the structural reforms, namely, trade liberalization, and the exchange rate on the labor market. Previous works that consider the labor market impacts of trade reform in developing countries emphasize impacts on the wage distribution (Green, Dickerson and Arbache, 2001, deFerranti and Perry, 2002, among others). Our focus differs as we look at employment. We study employment changes from a gross job flows approach. Gross job flows statistics are relatively recent and important
indicators, providing critical information on the source of net employment changes (Davis, Haltiwanger and Schuh, 1996). Different sources of net employment growth require different policy.

Stylized facts on job flows for developing countries are rare with the few exceptions of Roberts (1996) for Chile and Colombia, Tsou et al. (2002) for Taiwan and, more recently, a series of studies sponsored by the IDB¹. The magnitude of job flows may provide some measure of the actual degree of labor market flexibility. In general, developing countries have larger job flows than in developed countries, at least in manufacturing. There is no clear evidence on whether these flows have increased after the past decade of structural reforms.

The evidence of the effect of trade liberalization on employment have been considered in a few articles. Revenga (1992, 1997) suggests that import competition and exchange rate variations reduced net employment in import competing manufacturing industries in the US and Mexico, respectively. Using a gross job flows approach, Klein, Schuh and Triest (2003) and Gourinchas (1998, 1999) find an asymmetric effect of the exchange rate on US and French job flows. For the US, Klein, Schuh and Triest indicate that exchange rate appreciations decrease net employment by increasing job destruction, with no effect on job creation. For France, Gourinchas show that job creation is more responsive than job destruction. On the other hand, Roberts and Tybout (1996) do not uncover significant effects of import competition on gross and net job flows for Colombia and Chile. It should be noted that the latter authors do not considered the exchange rate in their study.

We follow a similar empirical strategy. A structural reduced form labor demand based equation is estimated with manufacturing industry data controlling for industry and time heterogeneity. Identification of exchange rate and import competition is achieved exploiting
cross-sectional and time variation within sectors. We use previously unavailable industry specific exchange rate indices.

Advancing our results, the estimates indicate that the effect of international factors on gross job flows is asymmetric. Exchange rate appreciation decreases net job growth by reducing job creation, while higher effective penetration reduces net job growth by rising job destruction. There is no statistically and economically significant effect on job reallocation, as trade related variables do not affect job creation and destruction simultaneously. In short openness influences job growth but the exchange rate does matter.

This paper is divided as follows. The next section provides an overview of the Brazilian economy and liberalization process. The third section presents theoretical considerations and a brief discussion of the literature. Gross job flow statistics and the empirical strategy are discussed, followed by the data used. Section six discusses the main empirical results and the last section provides concluding comments.

BRAZILIAN ECONOMIC BACKGROUND

During the 1990’s Brazil experienced large macroeconomic changes, as seen on Table 1. At the same time, it implemented significant structural reforms. After a massive recession and failed stabilization plan by President Collor in 1990, the country experienced very high inflation rates (above 20% per month) until mid 1994. The Real stabilization plan introduced in July 1994, was based on a fixed peg to the US dollar, fiscal surpluses and increased external
competition to damp price increases arising from post-stabilization real income gains. GDP growth was high over the 1993-1995 period.

The first half of the decade also witnessed a large trade liberalization reform, that actually started in 1988. The trade reform process included the extinction of non-tariff barriers, a significant decrease in nominal tariffs and the start of the Mercosur/Mercosul trade bloc agreement with Argentina, Uruguay and Paraguay (Mesquita and Correa, 1998). Median tariffs fell from about 55% in 1986 to 30% in 1990. They reached their lowest value in 1995, at just under 10%, increasing slightly over the next five years to about 15% in 1999. The tariff dispersion decreased sharply from 1986 to 1995 but did not increase with the rebound in mean tariffs from 1995 to 1999. The actual level of import penetration over the period increased steadily after 1990, when non-tariff barriers were sharply reduced. After 1995, with the overvalued exchange rate, imported goods market share rose to more than 10%, double the 1980's level.

During the second half of the decade, small inflation rates (down to 2% per year) coexisted with an allegedly overvalued exchange rate up to 1999 and increasing trade deficits. The external capital flows slowed to the country after the Asian and Russian crises in 1997 and 1998, respectively, worsening the current account problems faced since 1995. The external shocks took their toll on the economy driving it into a recession in 1998. On November 1998, a rescue package from the IMF provided some credibility to the dollar peg. Nevertheless, on January 1999, the exchange rate regime changed to a flexible one. By March 1999, the Real had fallen more than 50% with respect to its dollar value in December 1998. (see, e.g., Amann and Baer, 2000)
The labor market responded to these aggregate shocks over the decade. In particular, the impact of trade liberalization on manufacturing seemed impressive. From 1991 to 1998, based on Ministry of Labor data, this sector employment fell by more than 11%, or almost 300,000 jobs, while economy wide employment grew. After the devaluation in early 1999, manufacturing employment inverted its downward trend, reversing most of the losses of the previous period. In 1999 and 2000, manufacturing employment had a net growth of more than 170,000 jobs.

The above discussion suggests that the 1990’s were a period of varied macroeconomic conditions and different aggregate shocks. Three periods can be clearly set. From 1990 until 1994, with high inflation and the trade liberalization process; from 1995 to 1998, with a fixed/overvalued exchange rate and the slight reversal of liberalization; and 1999 on, with the flexible exchange rate. The shocks provide an interesting opportunity to study job flows in the economy, particularly the effect of trade variables.

THEORETICAL CONSIDERATIONS AND BRIEF DISCUSSION OF THE LITERATURE

The different macroeconomic and trade conditions over the 1990’s in Brazil provide an interesting case for the study of the effect of trade on employment flows. The effects of trade arise from changes in relative prices of domestically produced and imported goods. These changes can be induced by tariff changes and changes in the supply of specific goods, or exchange rate variations.
Following Campa and Goldberg (2001), there are three possible channels for the effect of trade on business profitability and thus, employment. First, demand shocks from increased competition in domestic output markets. Second, competitiveness shocks from greater export shares in sector output. Third, cost changes arising from changing input costs. There is also an indirect channel, which is differential access to foreign technology. The literature focus basically on the first two, as the latter two are hard to measure. The effect on employment depends on the adjustment of wages. Employment effects may be damped if wages are flexible (Revenga, 1992).

Within a sector, the response to these demand/cost shocks may be heterogeneous, as plants differ in their productivity, domestic and foreign competitiveness, and use of imported inputs. Businesses also differ in exposure to foreign trade. Differences in exposure can arise from differentiated product competition of exports or imports.

An example of the effect of trade on employment adjustment could arise from a decrease in tariffs (and currency appreciation). Within the sector, lower tariffs may reduce the price of a certain good, forcing import competing businesses to reduce employment (job destruction). The adjustment may not be identical across businesses, since firms are heterogeneous in profitability, non-convex adjustment costs and trade exposure as in Gourinchas (1998, 1999) and Klein, Schuh and Triest (2003). At the same time, the lower tariffs may provide access to cheaper inputs, leading to possible job creation. In short, a tariff movement could lead to simultaneous job creation and destruction.

As summarized in Fajnzylber, Maloney and Ribeiro (2001), trade liberalization and changes in exchange rate regimes in models of firm investment with irreversibility and uncertainty may influence entry and exit of firms, i.e. job creation and job destruction and net
employment growth. The direction of the impact of the reforms cannot be established theoretically. Lower barriers may decrease sunk costs and allow access to competitive foreign technology fostering entry. But uncertainty about the permanence of the regimes may increase the wait option value of investment. Even in this case, there are theoretical models that argue that this effect depends on the degree of market power, making the effect of reforms industry-specific.

Last but not least, there may be trade effects on job turnover. If one focuses on labor demand side shocks arising from exchange rate and/or tariff changes, the main implication would be large between sector movements and little within sector changes, as similar businesses (e.g. producing the same output, and thus classified in the same sector) would respond similarly. Within sector job reallocation would be small and/or non-responsive to shocks. Alternatively, if most job reallocation is within sectors, this suggest considerable plant heterogeneity (Gourinchas, 1998).

The empirical relationship between international factors and gross job flows was examined by Gourinchas (1999) for France, by Davis, Haltiwanger and Schuh (1996), Gourinchas (1998) and Klein, Schuh and Triest (2003) for the US, and by Roberts and Tybout (1996) for Chile and Colombia. Davis, Haltiwanger and Schuh and Roberts and Tybout did not find any pervasive effect of trade exposure on gross job flows, once sector characteristics were taken into account. Revenga (1992, 1997) looked at net job flows (net employment change) only for the US and Mexico. Her results suggest that employment depends on trade.

On the other hand, studies that take into account the effect of the exchange rate, as well as trade exposure, such as Klein, Schuh and Triest (2003) and Gourinchas (1998 and 1999) did find systematic effects from the exchange rate and the degree of openness on job
flow measures. Their method differs from DHS as they use regression analysis instead of ANOVA. Klein, Schuh and Triest argue that this accounts for the differences in results.

In fact, what may be the main difference in results is the study of exchange rate effects and not just the effect of the degree of openness on job flows. Klein, Schuh and Triest suggest that for the US, job destruction, job reallocation and net employment growth respond to exchange rate movements, while job creation unresponsive. Job reallocation was not studied. The sensitivity of job flows with respect to movements in the exchange rate increase with greater exposure to international trade.

For the US, Gourinchas (1998) found that exchange rate movements affect both job creation and job destruction in the same direction, which is unexpected. A devaluation of the US dollar decreases both job creation and destruction, at least for tradable sectors. Periods of depreciation are associated with a “chill” of the labor market.

For France, Gourinchas (1999) also found a strong influence of the exchange rate on gross job flows, with job creation more responsive than job destruction. Yet, contrary to the US, the movements are in opposite directions, and closer to what is expected, i.e., depreciations increase job creation and reduce job destruction. The symmetric movements of job flows suggest that reallocation did not change in the face of exchange rate shocks.

Last, Roberts and Tybout (1996) used regression analysis for Chile and Colombia and could not identify any significant effect from import penetration on sector entry and exit rates. In all, the limited evidence in the literature suggest that trade exposure, per se, is not strong enough to differentiate job flow measures across sectors and time, while exchange rate fluctuations are important.
STATISTICS AND EMPIRICAL STRATEGY

Our assessment of the effect of trade liberalization and exchange rate fluctuations on the employment level and its dynamics incorporates the large literature on job flows. The gross flow approach allows the investigation of the sources of net employment changes. It also provides some information on possibly heterogeneous behavior and adjustment costs of economic agents. The heterogeneous behavior and adjustment costs, may, in fact, help shed light on the effect of aggregate and specific shocks in the economy dynamics (Davis and Haltiwanger, 1992, Hall, 1999).

Employment dynamics at the macroeconomic or firm/establishment level are usually studied by looking at net employment changes from period to period and within a labor demand framework (Hamermesh, 1993). The aggregate, or average, measure of net employment change may obscure large differences in individual plant behavior. In order to explore this heterogeneity, Davis and Haltiwanger (1992) proposed a set of statistics for job flows, that look at the positive and negative part of the plant employment growth distribution. These statistics indicate the degree of business heterogeneity and provide a demand-side complement for usual measures of worker flows, such as worker turnover, that include both supply and demand side effects.
**Gross job flows statistics**

We measure gross job flows following Davis and Haltiwanger (1992) and Davis, Haltiwanger and Shuh (1996), DHS hereafter. The job flow statistics are calculated using employment levels \((n_i)\) for plant \(i\) in two points in time. The first statistic provides a weighted average of the employment change distribution, truncated for positive values only, and the second statistic an average truncated for negative values only. They are, respectively,

\[
POSt = \frac{\sum_{i=1}^{N} ((n_{it} - n_{it-1})/X_t)}{I(\Delta n_{it} > 0)},
\]

\[
NEG_t = \sum_{i=1}^{N} |(n_{it} - n_{it-1})/X_t| I(\Delta n_{it} < 0),
\]

for plants \(i=1,...,N\), where \(X_t\) is the average employment level for \(t\) and \(t-1\) in the economy, \(X_t = \sum_i (n_{it} + n_{it+1})/2\), and \(I(.)\) is the indicator function, returning 1 if the argument is true and 0 otherwise. Aggregate net employment change may be calculated as \(NET_t = POSt - NEG_t\).

As a measure of employment adjustment heterogeneity, DHS defines gross job reallocation \((SUM_t)\) as the weighted sum of the absolute value of employment growth rates, that is, the sum of job creation and job destruction rates,

\[
SUM_t = POSt + NEG_t.
\]

As this measure increases with the level of net employment change, a measure of job reallocation more closely related to the turbulence of the labor market may be defined as the excess job reallocation \((EJR_t)\):

\[
EJR_t = SUM_t - |NET_t| = 2 \min\{POSt, NEG_t\}.
\]
i.e., the fraction of gross job reallocation that cannot be accounted for the net employment expansion (or contraction). If the economy could be well characterized by a single representative firm, \( EJR \), would be zero.

**Empirical strategy**

In order to study the impact of trade exposure and exchange fluctuations on gross job flows, we specify two types of models. The focus is on manufacturing employment, as this sector is more exposed to trade. Manufacturing experienced an almost continuous decrease in employment from 1992 to 1998 (with slight increases in 1993 and 1994), with about 14\% of jobs destroyed. After the 1999 devaluation there was a reversal and employment grew remarkably, creating more than 170,000 jobs in two years.

Two issues motivate the models. First, data coverage over the 1991-2000 period. Tariff and trade flow variables are available up to 1998 only. This covers a large period but leaves the sharp 1999 devaluation out of the analysis. A model that does not require trade data would be needed to provide some information on the effect of the 1999 devaluation on job flows. Second, the interest in measuring the extent of gross and job flow movements rising from changes in trade exposure, tariffs, and the exchange rate movements. This requires a model with continuous regressors, over the 1992-1998 period.

The first model is a simple differences-in-differences exercise of the 1999 Real plan exchange rate regime change effect on manufacturing employment, that caused a 50\%
devaluation with respect to the previous four years. Using sector data over the 1992-2000 period, we run a time and sector fixed effect regression:

\[ Z_{it} = \sum_{s=1}^{5} \delta_{is} d_{i} + \sum_{t=1992}^{2000} \gamma_{t} Year_{i} + \beta (deval*tradable)_{i} + \nu_{it} \]

where the dependent variables \( Z_{it} \) are job flow measures (POS, NEG, NET, SUM) for each industry \( i \), and the time period covers from 1992 to 2000. Industries are divided in tradable (manufacturing subsectors) and non-tradable (others), with the non-tradable used as a control group. A dummy for the exchange rate devaluation (the 1999-2000 period), \( deval \), is interacted with this classification. Year and sector dummies (\( Year_{i} \) and \( d_{i} \) respectively) are included to provide the appropriate controls for aggregate shocks, such as monetary policy shocks, and sector heterogeneity. \( \nu_{it} \) represent a purely random term.

The discussion in the previous section suggest that, if the degree of heterogeneity is relatively constant across plants, the \( \beta \) coefficient should be positive for POS, negative for NEG, and positive for NET. There is no a priori effect of the devaluation on SUM. It could even be zero, if the coefficient in the POS and NEG regressions are symmetric.

The 1999 devaluation could be interpreted as an exogenous, or at least, unanticipated change in the exchange rate regime, given the government commitment to the previous regime in effect since the Real plan. The commitment had backing from the IMF in important crises over the period, such as the Mexican (1994), Asian (1997) and Russian (1998) crises, suggesting credibility. This method provides only qualitative evidence and abstracts from within manufacturing differences in response. Better and more informative results can be obtained through a structural model and better identification strategies.
The second model is a more structural model for manufacturing employment, based on Klein, Schuh and Triest (2003), Gourinchas (1999), and others. From a standard plant labor demand model \((e.g., \text{Hamermesh, 1993})\), trade openness, tariffs and exchange rate movements act as demand shifters. As plants differ in their technology, adjustment costs, market demand sensitiveness and competitiveness, heterogeneous responses to demand shocks generate heterogeneous employment changes, raising or decreasing employment, even within narrowly defined industries. A decrease in import penetration (understood as a domestic producer demand increase) may generate simultaneous job creation and destruction.

The industry aggregated labor demand model is a reduced form model, as the wage is not included, due to simultaneity. Alternatively, wages could be assumed to be set outside the industry (no single industry accounts for more than 4% of total employment) as in Burguess and Knetter (1998). The estimated model is

\[
Z_{it} = \alpha_1 IMP_{it} + \alpha_2 EXP_{it} + \beta \text{tariff}_{it} + \gamma rer_{it} + e_i + w_t + v_{it},
\]

where the dependent variables \(Z_{it}\) are job flow measures \((POS, NEG, NET, SUM)\) for each industry \(i\) in manufacturing, for period \(t\); \(IMP_{it}\) the import penetration rate or effective protection; \(EXP_{it}\) the export share of output, \(\text{tariff}_{it}\) the tariff for industry/sector \(i\), and \(rer_{it}\) the sector (log) real exchange rate. Fixed sector and year effects \((e_i \text{ and } w_t\) respectively) are included, as in the previous model to control for industry unobserved heterogeneity and aggregate shocks such as monetary policy.

The import penetration measures are obtained either as imports divided by sector output or imports divided by domestic absorption. Nominal tariffs are used, as well as tariffs
adjusted for aggregate real exchange rate and input use. The original trade data was constructed by Muendler (2001a, 2001b)\(^8\). In order to identify the exchange rate effect, we use industry specific exchange rates. They were constructed following Revenga (1992) and Gourinchas (2000) with data provided by the Trade Ministry (country sector import data) and the IMF (exchange rate data). The sector exchange rate is an import weighted average of the exchange rate of the trading partners of each sector. Contrary to Revenga, the weights are calculated each year. Data limitations restrict the analysis from the beginning of our data, in 1992, up to 1998, excluding the Real float of 1999. Here we use manufacturing industries data only as there is no import penetration or tariff data for the service and retail sectors.

We expect that \( \alpha_1 \) is positive (negative) for job destruction (creation) and negative for net employment growth, as greater import penetration is associated with lower plant output demand. \( \alpha_2 \) is expected to be negative (positive) for \( \text{NEG (POS)} \) and positive for \( \text{NET} \) by the same rationale. Higher tariffs or a devaluation of the exchange rate should foster net employment growth by decreasing \( \text{NEG} \) and increasing \( \text{POS} \). The effect of these variables on job reallocation is not clear \textit{a priori}. There may be opposite effects on \( \text{POS} \) and \( \text{NEG} \) that are actually symmetric, leaving the sum unaltered. Alternatively, \( \text{POS} \) and \( \text{NEG} \) may change in asymmetric ways (due to non-convexities), generating changes in job reallocation. Put in other way, should the trade shocks increase the variance of business net employment change distribution, job reallocation will change.

The use of the exchange rate may raise questions about its endogeneity due to productivity shocks or general equilibrium effects. Our identification strategy is based on the use of industry specific bilateral exchange rates and time dummies. Clearly, aggregate technology shocks would change the relative prices of tradable and non-tradable goods.
pushing both the exchange rate and employment. Yet it is reasonable to say that industry specific shocks are too small to influence country exchange rates. Aggregate shocks are accounted for with time dummies. A similar strategy is used by Gourinchas (1998, 1999).

It could be argued that there is a possible endogeneity of the trade measures, particularly import penetration. Employment reductions shocks in a sector could induce the erection of tariff and nontariff barriers that decrease import penetration.(Muendler, 2002), generating bias in the estimates. To control for this possibility we experiment with US 4-digit price indices, aggregated to match our sector definitions, as an instrument for import penetration. We estimated the relevance of the instrument, by looking at the significance of the instrument in an auxiliary regression of import penetration on sector and time dummies and our instrument. Weak instruments may generate results more biased than simple OLS. Unfortunately the instrument is not significant at all, so instrumental variables are not used.

Before discussing the data, it must be mentioned that our analysis will not control for technological change. This could explain part of the response of job flows to trade. For example, a devalued exchange rate makes imported labor saving technology expensive, reducing job destruction. Yet, measures of technical progress are hard to get by, as other authors have pointed out (Kletzer, 2000). This is a limitation of the study as it has been argued that technological change was an important force influencing labor demand for developing countries (deFerranti et al., 2002).

DATA
The data set used is based on the Relação Anual de Informações Sociais (RAIS – Annual Social Information Report) microdata. RAIS is organized annually by the Ministério do Trabalho e Emprego (MTE – Labor Ministry). It is an administrative report filed by all tax registered Brazilian establishments. The information is collected in the first quarter, referring to the previous year, and it covers the whole country. Due to compliance trends, we restrict our analysis to the period from 1991 to 2000. The data covers approximately two million establishments and twenty four million workers, on average, every year.

The main variables available from the survey used in this work are: establishment size, measured as the number of salaried workers on December 31st and industry classification (25 IBGE subsectors). There is no information on plant characteristics. The unit of observation is an establishment/workplace, be it an individual enterprise or a branch or plant of a large firm. Plants receive a unique number that is used to create the longitudinal data.

RAIS may be considered a census of the formal Brazilian labor market, as all formal businesses should file the RAIS report, regardless of size and ownership. We understand the formal sector as tax and social security registered establishments only. In principle, we should expect a good coverage of entry and exit, with entry considered when the business files for the first time and exit when it stops reporting for a long period. In order to obtain more confidence in the calculated statistics, due to reporting errors, we set a lower bound on plant size at 5 employees. Entering plants are considered when they cross the 5 employees threshold or enter with size greater than or equal to 5 employees (similarly for exiting plants). About 7 to 9% of all jobs in the economy are lost in this procedure. The cut off level is arbitrary but provides statistics more comparable with other works in the area, such as DHS, and should
reduce measurement error in job flows, particularly entry and exit. Further details are available with the authors.

**MAIN RESULTS**

Before looking at the effect of trade liberalization and the exchange rate on job flows, we present gross job flows in Brazil, as they little known and of their own interest. More details on job flows can be seen in Menezes-Filho (2003).

**Gross job flows results**

Table 2 presents the yearly job flows for Brazil covering formal enterprises with 5 employees, on biannual average, or more, and including entering and exiting plants. A remarkable feature is large job reallocation rates, above 28%, with an yearly average of 30.8%. Given an average net employment growth of about 1.1% per year over the period, the excess job reallocation average is almost 29%. Every year, firms created an average of 16% of jobs in a given year, while job destruction rates were 14.9%, on average, during the 1990’s. Comparison with other countries is limited by sample coverage differences. Most studies cover only manufacturing, while services and construction tend to have higher reallocation rates. The higher the minimum firm size, the lower reallocation rates tend to be.
Countries with relatively more larger plants tend to have lower reallocation rates. Nevertheless, Boeri and Cramer (1992) have similar coverage for Germany and their reallocation rate is about half of the Brazilian rate.

Just as aggregate employment growth obscures the heterogeneity in plant employment behavior, the aggregate job flow figures obscure the differences between sectors. The results by sector are presented in Table 3. The data set reflects the importance of the service sector in the economy alluded to in the introduction. The service and retail sectors account for almost 43% of the formal jobs in the Brazilian economy. Manufacturing, on the other hand, accounts for only 22% of employment. Over the 1990’s, the change to a services-based economy that accompanies the development process is reflected in the average yearly net employment growth rate (positive for Retail and Services and negative for Manufacturing). It is important to mention that from 1992 until 1998, Manufacturing faced a net decrease in employment that was almost reversed in the years after the 1999 devaluation. The reduction in Utilities was most likely affected by the downsizing after privatization of previously state-owned utilities over the period. The impressive employment growth in agriculture may reflect both the formalization of employment relations in the rural areas and the strengthening of the agribusiness sector.

Despite the net employment growth differences, all sectors replicate the large reallocation rates seen in the aggregate figures. The Public Administration sector and Utilities have reallocation rates of 20% at most. On the other extreme, Construction has an average reallocation rate of more than 60%, followed by Agriculture (45,4%), Retail (38,9%) and Manufacturing (32,8%). The Manufacturing reallocation rate seems to be one of the highest in the world, compared with other developing countries and similar surveys (e.g. Roberts and Tybout, 1996 and Davis and Haltiwanger, 1999).
As mentioned above, a better comparison of aggregate job flow rates with other countries should take into account sector differences. A “back of the envelope” calculation of the reallocation rates to the US figures can be made using employment share data across sectors from the Bureau of Labor Statistics. Using the US sector distribution and the Brazilian sector job flow rates presented in the table, the Brazilian non-agricultural reallocation rate using the US sector employment distribution would actually be higher (31.7% with US weights, compared to 30% in the data). It thus seem that the cross-country differences in reallocation rates cannot be simply be attributed to differences in the structure of the economy.

The impact of trade liberalization on job flows

The above analysis indicated that the Brazilian labor market is very active with high job reallocation rates and large within sector job reallocation. Over the 1990s, Brazil experienced a deep trade liberalization process and different macroeconomic conditions. At the same time, there seems to be a slight upward trend in job reallocation. It would be interesting to contrast the dynamics of job flows with the trade liberalization process to measure the extent that this structural reform affected the labor flows.

The simple differences-in-differences estimator for the 1999 devaluation presents a first exploratory method for the effect of international factors (the exchange rate in particular) on manufacturing job flows. In table 4 we see that the large 1999 devaluation had a significant effect on job creation (positive effect), destruction (negative) and net employment growth
(positive) on manufacturing employment (traded), when compared to non-traded, i.e. non-manufacturing, controlling for macroeconomic and fixed sector-specific conditions through time and sector dummies. It is important to note that either job reallocation (SUM) or excess job reallocation (EJR) did not increase with the devaluation. A first message from the exercise is that the exchange rate seems to matter on trade-exposed sectors of the economy.

In order to provide a more complete picture of the effect of trade on job flows we present the estimates of the quantitative regressors model in Table 5a. The results suggest that higher trade openness decreases net employment growth by increasing job destruction (although the latter significant at the 15% level only). Its effect on job creation is clearly insignificant. A 1 percentage point increase in import penetration (about 10% of its current value), would decrease net employment growth by 0.57%. This is an economically significant result, given an average net employment change of less than 2%.

There is a significant effect of the (log) real sector exchange rate, implying that a devaluation of the Real increases net job growth, through job creation only. A 10% devaluation of the exchange rate would increase net employment by 0.27% a smaller response than the import penetration effect. The figures are similar to the US (Gourinchas, 1999). Job reallocation does not change with higher exposure to trade either by lower tariffs, higher import penetration nor exchange rate movements. The only effect of tariffs seems to be on excess job reallocation, reducing it. Higher tariffs appear to “chill” the labor market.

In order to provide more confidence on the results, the same models were estimated using effective penetration (imports divided by domestic absorption), sector export shares (exports divided by output). The results are on Table 5b. The same qualitative results were obtained. Tariffs affect EJR only, reducing it; Job creation is influenced by the exchange rate,
while job destruction is influenced by import effective penetration and the export share. These variables influence net flows and none affect job reallocation. In addition, exports increase net job growth by reducing destruction. The effect of a 1 percentage point increase in sector export share of output is a 0.44% increase in net employment growth. The results on the effects of tariffs and the exchange rate seem remarkably robust between specifications.

The asymmetric effects on job creation and destruction indicated by our results are not unexpected nor unusual in the literature. They suggest significant heterogeneity and non-convex adjustment costs, as in Gourinchas (1998, 1999) and Klein, Schuh and Triest (2003).

In sum, we studied the effect of structural reforms associated with international factors such as trade liberalization and exchange rate regime changes on manufacturing employment job flows. The first exploratory analysis over 1992 to 2000, based on a differences-in-differences approach, looking at the 1999 Real devaluation as a “natural” experiment that affected differently traded (manufacturing) and non-traded (non-manufacturing) sectors suggests that the devaluation affects positively job creation, negatively job destruction and separations and positively net job growth, with no effect on reallocation or turnover measures.

In a model with trade openness measures, covering the 1992-1998 period, import penetration increases job destruction and separations and decreases net job growth. The exchange rate has an opposite effect, increasing job creation and hires and increasing net job growth. Lower tariffs have basically no effect, given the exchange rate and import measures.
CONCLUDING COMMENTS

The goal of this article was to study the effect of structural reforms, namely, trade liberalization, and the exchange rate on employment, from the gross job flows approach, looking at the case of Brazil. The gross job flows statistics provide important information on the source of net employment changes. The Brazilian case is interesting for a number of reasons. It is the largest South American economy; over the decade it experienced deep trade liberalization; at the same time there were large fluctuations on the exchange rate; and the significant reduction in manufacturing employment prompted a backlash in the political arena against the liberalization process, in a case of “Reform Fatigue” (IABD, 2004).

We develop our study looking at job flows, as they provide a better understanding of labor market dynamics than looking at net employment changes solely. Job flows in Brazil, as in most developing countries, seem to be larger than in developed countries, even after controlling for sector composition and firm size differences. This suggests significant business heterogeneity in responses to shocks that is unaccounted for in empirical studies using net job changes.

Our results suggest that across the 1990’s, yearly gross job flow measures maintained similar levels suggesting that trade liberalization per se cannot be accredited with the high flows identified in this study. More importantly, the effect of trade and exchange rate variables on net job growth is differentiated. While devaluation increases net job growth by increasing job creation, import penetration decreases job growth by raising destruction. Higher exports create net employment by reducing job destruction. The magnitude of effect of the trade variables is not small, as a 10% change in them would lead to about 0.6% change in net job
flows, about half the yearly average. Tariffs do not have any statistically significant effect on employment flows. Job reallocation, a measure of resource movement in the economy, was not significantly related to the variables studied, particularly tariffs. Thus trade variables appear to have an asymmetric effect on job flows. Significant non-convex adjustment costs could explain this asymmetry, but that warrants further study. In addition, we have used identification rules that are based on the size of industry productivity shocks relative to aggregate changes in exchange rates. With better available data, a set of instruments could be used to give more confidence on the results.

For policy analysis, one of the messages is similar to that of Revenga (1992). Greater openness may hurt manufacturing employment generating labor adjustment and worker displacement. This would justify a possibly negative public reaction to trade liberalization processes. On the other hand, we echo Gourinchas (1999) in that the exchange rate does matter, now in the context of developing countries, although with possible transitory effects. A significant part of the sharp reduction in manufacturing employment over the 1990’s in Brazil, and possibly in other Latin American countries, was due to the overvaluation of the exchange rate, used by macroeconomic stabilization policy to influence inflationary expectations. The “ills” of trade reform could be reduced with a more flexible exchange rate.

At the same time, it must be made clear that this paper did not evaluate the appropriateness of trade liberalization. Employment is only one of the many variables involved in trade reform evaluations. There may be significant efficiency gains that were addressed elsewhere (e.g. Muendler, 2002 and IDB reports). In addition we considered mostly manufacturing employment and did not distinguish transitory from permanent changes.
Although the focus of most works, manufacturing employment represents a small share of total employment.
FOOTNOTES

* - The research was part of the Inter-American Development Bank Research Network - 11th Round, as part of the research team on Labor Market Dynamics in Brazil, led by Naercio Menezes-Filho at FIPE/USP. We thank the Brazilian Labor Ministry for access to the data; John Haltiwanger, Carmen Pages, Alexandro Micco, Adriane Kugler and seminar participants at Madrid and Washington and Ibmec (Brazil) and particularly a referee for comments and suggestions. Fabio Soares generously provided the raw bilateral trade and exchange rate data and suggestions on the sector rate construction. All errors are ours. The opinions expressed should not be associated with any of the institutions the authors are affiliated. This version May, 2004.

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*** - Instituto de Pesquisa Economica Aplicada (IPEA), Brazil.

2 - On the other hand, the fact that there were no changes in hiring and firing costs, nor in the tax code help identify the effects of trade liberalization and exchange rate movements on job flows.

3 – The data below for Brazil suggest simultaneous import penetration of final goods and export activity within a given sector, i.e., within industry trade seems pervasive. Import penetration ratios are not zero in exporting sectors (export share more than 20% of output) and vice versa.

4 – Plant entry and exit rates are related to the job creation and destruction discrete margin. They measure the number of firms entering or leaving a sector, instead of the employment flows. They are comparable if one assumes firms enter (and exit) with similar employment sizes across sectors.

5 – There are two other strands of the literature close to our work. Papers that relate trade liberalization and the exchange rate to labor demand elasticities such as Slaughter (2001) and Fajnzylber, Maloney and Ribeiro (2001). And papers that focus on net employment changes such as Revenga (1992, 1997) and Burguess and Knetter (1998).

6 – It could be the case that non-tradables have different dynamics than tradables over the business cycle, invalidating it as a control group. To provide some evidence on that, the same model was estimated using only manufacturing industries only. The qualitative results on the
deval dummy (not interacted, as there is no control group), are basically the same. We thank Adriana Kugler for this point.

7 – In addition, there may be general equilibrium effects that influence both tradable and non-tradable sectors. The devaluation may increase wages in both tradable and nontradable sectors if the tradable sector is large enough to influence labor market clearing. This would lower employment in the non-tradable sector as they are not benefiting from lower import competition and generate a positive interaction dummy. We thank the referee for this point.

8 – The tariff and import penetration series are presented for the \textit{nivel100} or \textit{nivel80} classification. The RAIS data use an alternative classification, denoted \textit{subsetor ibge}, that aggregates manufacturing in thirteen industries. The \textit{subsetor ibge} is broadly consistent with ISICv.2. Details are available with the authors.

9 – One may argue that our estimates on formal employment growth give a wrong picture of the labor market, as the 1990’s were a period of an increasing informal employment share of total employment. Yet the positive growth in formal employment is not incompatible with a higher informality rate, as long as the informal employment grows at a higher rate. Using indirect evidence from the PNAD household data (the PNAD data refers to September, while our data refers to December, and there may be firm size and regional coverage differences), the argument is confirmed. The same argument is valid for the measured increase in unemployment after 1997, while our data suggest non-negative net employment growth. Unemployment figures are for six metropolitan regions, while our data covers the whole
country. There have been systematic differences between aggregate employment growth and metropolitan unemployment rates over the years.

10 – We ran a few robustness checks. First, the results do not change qualitatively, if the regression is run from 1995-2000. As noted from table 1, over the 1990’s the exchange rate has three distinct periods: 1990-1993, 1994-1998 (overvalued) and 1999-2000. Second, the model was estimated for manufacturing only, with the cost of not using a control group. The main implication is that job reallocation is now marginally affected by the devaluation. Finally, the exercise is applied focusing on the data from 1992 to 1998, to measure the effect of the exchange rate appreciation after 1995. The signs are symmetric as those of Table 3, with a small loss in precision.
REFERENCES


Menezes-Filho, N. (org) 2003 Labor Market dynamics in Brazil. Research report, FIPE-USP / IADB.


<table>
<thead>
<tr>
<th>Years</th>
<th>Real GDP Growth</th>
<th>Unemployment Rate</th>
<th>Real Exchange Rate</th>
<th>Inflation Rate</th>
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<th>Current Account Balance*</th>
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<td>6.0</td>
<td>-698</td>
<td>-24225</td>
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</table>

Source: IPEADATA (www.ipeadata.gov.br); *-in million US dollars
Table 2: Job Flows For Brazil, 1991 - 2000

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<tr>
<th>Years</th>
<th>POS</th>
<th>NEG</th>
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<th>SUM</th>
<th>EJR</th>
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<td>0.3087</td>
<td>0.2925</td>
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Source: Authors calculations based on RAIS microdata.
Table 3: Job Flows by Sector, Brazil, 1991-2000

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<td>Utilities</td>
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Source: Authors calculations based on RAIS microdata.

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<td>38.34*</td>
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</table>

Note: *- indicates significant at 5%. Fixed Effects Regression of 225 (25x9) industry-year job flow measures with time dummies. Devaluation indicates 1999 and 2000 and tradable, industries in manufacturing.

<table>
<thead>
<tr>
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Note: **- indicates significant at 5%, *-indicates significant at 10%.**

Fixed Effects Regression of 90 (13x7) industry-year job flow measures, with year dummies. Import Penetration is industry imports divided by industry output. Output Tariffs are adjusted for the aggregate real exchange rate (US$/Real). The (log real Industry) Exchange Rate is measured in Reals by foreign currency; it is an industry specific exchange rate index, calculated as a weighted average of bilateral exchange rate indices using country-industry import shares as weights. See details in text.

<table>
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<tr>
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Note: **- indicates significant at 5%, *-indicates significant at 10%. Fixed Effects Regression of 90 (13x7) industry-year job flow measures, with year dummies. Effective Penetration is imports divided by domestic absorption. Export share is industry exports divided by domestic output. Industry Tariffs are adjusted for the aggregate real exchange rate (US$/Real). The (log real Industry) Exchange Rate is measured in Reals by foreign currency; it is an industry specific exchange rate index, calculated as a weighted average of bilateral exchange rate indices using country-industry import shares as weights. See details in text.