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Carlos Henrique CORSEUIL
University College London / IPEA

ICHIMURA Hidehiko
RIETI

RIETI
Research Institute of Economy, Trade & Industry, IAA

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NEW EVIDENCES ON WHAT JOB CREATION AND JOB DESTRUCTION REPRESENT

Carlos Henrique Corseuil[1]
University College London and IPEA

Hidehiko Ichimura[1]
University of Tokyo and RIETI

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Abstract

An alternative measure for gross job flows, incorporating within plant job reallocation, is proposed. Based on data with detailed information about workers occupation, we report the following results:
1. Most of the stylized facts about job reallocation do not change when we take into account within plant job reallocation.
2. Job creation and job destruction figures are decomposed into job created (destructed) by new (dying) firms, job created (destructed) by existing firms by expanding (contracting) workers in existing jobs, and the jobs created (destructed) due to the birth (death) of job categories in incumbent (surviving) establishments. We call the third component as the job mix component. It turned out that the job mix component corresponds to 30% (40%) per cent of job creation (destruction).
3. Also, we describe patterns of job reallocation, and each of the components, by job characteristics as opposed to workers characteristics. The job mix component of both job creation and destruction are concentrated among non-production activities and managerial positions.
4. We interpret these results as evidence that organizational change should be considered as one of the most relevant underlying causes of the employment movements reflected by job creation and job destruction measures.
5. Finally we evaluate the relevance of specific dimensions of organizational change, such as intra-firm reallocation of job categories, outsourcing, changes in the product mix, and labor division. The results points to labor division as the most relevant dimension of organizational change among the ones considered.

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1 Introduction

1.1 Motivation

The paper shows new results on gross job flows and considers some underlining determinants not analyzed before. Our main goal is to contribute to the understanding of what job creation and job destruction represent.

1.2 Conceptual aspects on job flows

Standard job flow numbers are based on net employment growth at the plant level.[1] Shifts in labor demand is often pointed as the theoretical counterpart of these numbers. Some papers investigate the underlining determinants of these shifts. The literature has focused almost exclusively on two determinants: i) shifts in the demand for output, and ii) shifts in productivity/efficiency level. This is a consequence of the assumption that labor is a homogeneous input. In other words "how much to produce" have been considered but decisions on organizational structure, such as "how to produce" or "what to produce" are ignored. We show that empirically these factors are important.

1.3 Contributions

This paper has four contributions to the literature on gross job flows. First, new measures of job creation and job destruction are proposed assuming heterogeneous types of labor inputs. The second contribution consists on some alternative decomposition for job creation and job destruction numbers which allow us to access the relative importance of changes on organizational structure. Third, we propose a baseline structure that relates job categories to different activities performed in a firm. Using this proposed aggregation, we show results of job creation and job destruction according to the different activities performed in a firm. Finally we do some further investigation to evaluate the contribution of some specific underlining causes of job reallocation related either to changes in organizational structure, such as out-sourcing, labor division or product diversification.

[1] See Davis and Haltiwanger (1999) for an extensive survey of this literature.

2 Data and Implementation

2.1 Longitudinal links and novelty.

We will implement the empirical analysis with a matched employer-employee longitudinal data, similar to the ones available for some European countries. The important novelty of this data is the detailed information available for workers occupation, consisting on a categorical variable coded at three digits level. This information allow us to compute the stocks of workers, in each one of the 350 occupation categories, within each establishment, for consecutive years.[2]

2.2 Primary source, time period.

Our data comes from a Brazilian administrative file (Relacão Anual de Informacões Sociais - RAIS) maintained by the Brazilian Ministry of Employment and Labor (Ministério do Trabalho e Emprego - MTE). All registered tax payers establishments are supposed to send information about all employees which have worked anytime during the reference year, which means that all industries are included.[3] We will use information from 1994 to 2001. Although information is available since 1986, we have some reasons not to use the whole period. There was an upward trend in coverage in the late 1980's. The recent availability of some variables and changes in definition of others in 1994 is another reason. Moreover some structural transformations in Brazilian economy in the early 1990s provide yet other reason. Sample size is about 2 to 2.5 million registered establishments per year and the overall stock of employed workers in these establishments varies between 20 to 25 million per year.

2.3 Proposed measures

Our proposed measures for job creation (POS^*) and job destruction (NEG^*) are the following:

$$POS_t^* = \sum_j \sum_i (\Delta n_{ijt}/X_t) \cdot I(\Delta n_{ijt} > 0)$$

$$NEG_t^* = \sum_j \sum_i [(-\Delta n_{ijt} - q_{ijt})/X_t] \cdot I(\Delta n_{ijt} < -q_{ijt} \leq 0)$$

[2]Some screening procedures applied in the original data set are described in appendix A

[3]However this is not a census coverage since non-tax payers are missing from the sample.

Table 1: Comparing job flow measures

	1995	1996	1997	1998	1999	2000	2001
Creation							
D&H	17.9	17.0	17.4	17.5	18.1	18.8	18.2
POS*	27.5	24.6	24.5	24.6	25.2	25.8	25.6
Destruction							
D&H	17.9	16.2	15.9	15.7	14.8	13.4	14.5
NEG*	24.2	21.2	20.5	20.4	19.9	18.3	19.5

n_{ijt}: employment level in plant i, in job type j, at the end of year t.
q_{ijt}: quit flow in plant i, in job type j, during year t.
X_t: aggregate average employment level between $t-1$ and t.

2.4 The use of quits

In netting out quits we are considering that firms still have the job position open. However this might not be the case. In the presence of firing costs firms may take advantage of a quit movement to destroy a job without cost. In this sense we have a lower bound for the job destruction rate. In order to have also a lower bound in the job creation rate we did not added the quits in our measure.

3 Comparable Results

In this section we first compare the numbers for job creation and job destruction when using the proposed measures above and the traditional one by Davis and Haltiwanger. We also revisit some stylized facts about job flows using the new measure. These facts have proved to provide insights into the link between job flows and labor demand shifts, and also on the nature of these shifts.

3.1 Aggregate results using the new measure

On average, job creation increases from 17.9% to 25.4% when within plant reallocation is considered. Job destruction also increases significantly. It goes from 15.4% to 20.5% on average. The seven percentage points difference between the two measures of job creation is quite stable over time, as is also the case for the five percentage points difference on job destruction measures. Year 1995 is the only exception to this pattern.

Table 2: Job flows and employment flows

	1995	1996	1997	1998	1999	2000	2001
Creation							
POS*	27.5	24.6	24.5	24.6	25.2	25.8	25.6
Hiring Rate	50.2	46.7	48.9	46.7	45.7	50.3	51.5
Destruction							
NEG*	24.2	21.2	20.5	20.4	19.9	18.3	19.5
Separation Rate	49.6	44.4	44.7	43.7	41.8	43.6	46.0

If at each plant level there is either new hires or new separations and not both, then these two measures should not diverge. Thus this result indicates that there is an intense job reallocation process going on within the plants.

3.2 Job flows and employment flows

Even the significant amount of job reallocation within plants considered above turned out to be an underestimate of an actual turnovers within a plant.

We examine the hiring rate and the separation rate. The hiring rate is defined as the sum of any new hiring between the end of year $t-1$ and at the end of year t divided by the average employment level between the one at end of year $t-1$ and at the end of year t.

The separation rate is defined as the sum of any new separation between the end of year $t-1$ and at the end of year t divided by the average employment level between the one at end of year $t-1$ and at the end of year t.

Table 2 reports the results. One can see that employment flow rates are consistently almost twice the level reported for job flow rates.

At each plant level for each job if there is either job creation or job destruction and not both, then these two measures should not diverge. This finding indicates that even within a narrow specification of jobs, at each plant level, there are hiring and separation processes going on concurrently.

This finding is significant and warrants further investigation. However, in the present analysis, we examine across job reallocation.

As the cyclical features of job flows is not our main concern, we will rely on temporal averages for all tables for the remaining sections.

Table 3: Persistence of job flows after one and two years — lower bounds

	Creation	Destruction
standard rate	25.3	26.1
1 year later	15.7	23.7
2 years later	11.4	22.5

Table 4: Persistence of job flows after one and two years — upper bounds

	Creation	Destruction
standard rate	25.3	26.1
1 year later	16.7	23.8
2 years later	11.9	22.9

3.3 Persistence

One important stylized fact on job flows is related to the persistence of the underlying employment movement. Davis and Haltiwanger (1999) report that, for different countries, 70% to 78% of jobs created remain filled one year later and 51% to 65% two years later.[4] Numbers for job destruction show higher level of persistence. They vary from 71% to 92% when considering one extra year and from 58% to 87% for two years.

Tables 3 and 4 show that a similar pattern is registered for numbers based on our new measure of job flows. Between 62% and 66% of jobs created (15.7 and 16.7 out of 25.3) are still occupied one year later.[5] Even two years later we still have almost half of the jobs created still occupied. The results are even more pronounced for job destruction, with 91% of jobs destroyed not recovered one year later and between 86% and 88% two years later.[6]

3.4 Plant characteristics: by industry

Most of the papers in the job flow literature limit their analysis to the manufacturing industry. When this is the case they tend to investigate the job flow pattern across industry groups within the manufacturing sector. As we have data for all industries, we will split the analysis across industry in two

[4]See Davis and Haltiwanger (1999) Table 6.

[5]Upper and lower bounds for the persistence of job creation follows alternative assumptions on subsequent employment adjustment driven by quits. The lower bound consider this subsequent movement as a reversion on job creation, while the upper bound does not. Analogous bounds are considered for job destruction.

[6]For this table we restricted the sample period from 1994 to 1999 for the calculation of the standard rates

Table 5: Job flow by plant–industry

	Creation	Destruction
aggregate	**25.4**	**20.5**
manufacturing	24.7	22.5
trade	33.2	25.0
utilities	13.0	16.8
agriculture	29.8	22.2
construction	41.6	36.5
public administ.	15.8	12.3
mining, gas, oil	27.9	23.6
hotel, restaurants	32.0	22.1
transport, comun.	21.2	18.1
financial	24.0	26.0
education	20.7	16.2
health	20.0	14.1
serv for firms	31.2	22.3
serv for individuals	26.3	19.7

steps. First we will use a classification where manufacturing is aggregated in one group while service is disaggregated in 8 groups. Then we look for a 2 digit industry categorization for industries within the manufacturing sector.

Table 5 shows results for the first step.

One can see that service sectors dominated by the public sector (utilities, public administration, transportation and communication, education, and health) are associated with the lowest rates of job creation and job destruction. Apart from these industries, others tend to have higher levels of job flow than manufacturing, which is consistent with findings in the literature using the standard measure. It is worth noting the high levels of job flows for the construction industry.

Davis and Haltiwanger (1999) points out that within manufacturing, there is no industry with job flow rates far below the average. This is also the case in our data. According to Table 6 there is only one industry with job creation rate below 20%, which is also the case for job destruction.

3.5 Plant characteristics: by age and size

Age and size are characteristics often analyzed in the job flow literature. This is due to their link with theoretical predictions contained in models of firm growth. Like Davis and Haltiwanger (1999) we opt for a bivariate analysis instead of the univariate method employed in most of the other papers. The

Table 6: Job flow by plant industry–manufacture 2 digit sectors

	Creation	Destruction
aggregate	**25.4**	**20.5**
food	26.2	23.4
tobacco	23.0	22.5
textile	20.8	22.0
clothes	28.2	23.6
leather, shoes	23.5	19.4
wood	30.2	23.0
cellulose, paper	22.6	22.3
publishing, printing	25.2	21.6
coke, petrol, fuels	26.4	26.7
chemical	23.9	23.1
plastic, rubber	23.0	21.1
non-methalic minerals	24.6	20.6
Primary metals	22.9	23.6
Fabricated metals	26.1	23.0
Non-electric machines	21.3	21.8
computer, office machines	30.4	28.0
electric equipments	24.0	23.2
eletronical	28.5	29.1
instruments	23.2	22.5
automobile	19.6	20.5
transport equipments	26.0	29.0
furniture	27.6	22.0
recycling	37.1	21.8

Table 7: Job creation by age and size categories

	(0;5)	[5;10)	[10;50)	[50;250)	[250;1000)	≥1000
2nd year	36.4	44.3	42.3	39.6	35.6	37.6
3rd year	32.0	34.4	33.9	29.8	26.7	27.9
4th year	29.4	31.1	27.7	28.2	23.8	24.5
5th year	28.6	28.2	27.4	26.1	19.6	17.4
6th year	29.0	26.6	25.1	23.6	25.2	20.6

Table 8: Job destruction by age and size categories

	(0;5)	[5;10)	[10;50)	[50;250)	[250;1000)	≥1000
2nd year	54.0	38.3	33.2	28.2	25.4	21.7
3rd year	50.7	35.5	30.2	28.5	25.8	15.9
4th year	47.2	33.8	31.7	26.7	21.1	17.6
5th year	45.5	31.2	28.2	25.1	24.4	22.7
6th year	41.3	31.2	27.6	23.1	16.8	17.4

results for job creation are shown in Table 7 while Table 8 brings the results for job destruction.

One can see a trend of negative correlation in job flows with age and size. This was also documented by Davis and Haltiwanger (1999) using the standard measures. One novelty introduced here is the separate analysis of job creation and job destruction. The comparison of the two tables mentioned above allow us to say that while the negative correlation with age is stronger for job creation results, the one with size is dominant for job destruction results.

4 New results: decomposition

4.1 Methodology

Created jobs are either in new establishments or in existing establishments. Jobs created in existing establishments can be classified into those in existing positions and those in newly created positions. Therefore we can decompose newly created jobs into three components:

$$POS_t^* = POS_t^{bth} + POS_t^{mix} + POS_t^{cont}$$

where POS_t^{bth} denotes the job creation contribution of the newly born establishments, POS_t^{mix} denotes the contribution of the newly created jobs

within existing establishments and POS_t^{cont} denotes the contribution of the expanded jobs within existing establishments.

Analogous decomposition can be made for the destructed jobs. Thus analogously we have

$$NEG_t^* = NEG_t^{dth} + NEG_t^{mix} + NEG_t^{cont},$$

where NEG_t^{dth} denotes the contribution of the extinct establishments to the destructed jobs, NEG_t^{mix} denotes the contribution of extinct jobs within existing establishments, and NEG_t^{cont} denotes the contribution of the contraction of jobs within existing establishments.

More formally the definitions are as follows:

$$POS_t^{bth} = \sum_j \sum_i [(n_{ijt}/X_t) \cdot I(n_{it} > 0 \cap n_{it-1} = 0)]$$

$$POS_t^{mix} = \sum_j \sum_i [(n_{ijt}/X_t) \cdot I(n_{ijt} > 0 \cap n_{ijt-1} = 0 \cap n_{it-1} > 0)]$$

$$POS_t^{cont} = \sum_j \sum_i (\Delta n_{ijt}/X_t) \cdot I(\Delta n_{ijt} > 0 \cap n_{ijt-1} > 0)$$

$$NEG_t^{dth} = \sum_j \sum_i [(n_{ijt-1} - q_{ijt})/X_t] \cdot I(n_{ijt-1} > q_{ijt} \geq 0 \cap n_{it} = 0)$$

$$NEG_t^{mix} = \sum_j \sum_i [(n_{ijt-1} - q_{ijt})/X_t] \cdot I(n_{ijt-1} > q_{ijt} \geq 0 \cap n_{ijt} = 0 \cap n_{it} > 0)$$

$$NEG_t^{cont} = \sum_j \sum_i [(-\Delta n_{ijt} - q_{ijt})/X_t] \cdot I(\Delta n_{ijt} < -q_{ijt} \leq 0 \cap n_{ijt} > 0)$$

4.2 Aggregate results

The results are reported in Table 9. We find that about 40% of job creation and about 45% of job destruction are due to creation of new jobs and destruction of jobs into extinction in continuing plants. This means that in addition to understanding how plants come and go and understanding how existing plants expand and contract existing jobs, we need to understand how existing plants try new jobs and give up on them.

The result above indicates that establishments changes considerably their internal organization of jobs. This makes the decision on "how to produce" potentially very relevant.

Tables 10 and 11 show persistence results by job flow components. It is interesting to note that both old and mix component have very similar

Table 9: Decomposition of job flow measures

	Creation	Destruction
1995–2001 average	**25.4**	**20.5**
birth/death (bth/dth)	6.8	2.6
job mix (mix)	**7.4**	**8.4**
ongoing job categ. (old)	11.1	9.5

Table 10: Persistence of job flows after one and two years: lower bounds

	standard	1 year later	2 years later
Creation	**25.3**	**15.7**	**11.4**
birth (bth)	6.8	4.5	3.3
job mix (mix)	7.5	4.5	3.3
ongoing job categ. (old)	11.0	6.7	4.8
Destruction	**26.1**	**23.7**	**22.5**
death (dth)	7.7	7.7	7.7
job mix (mix)	8.6	7.7	7.5
ongoing job categ. (old)	9.9	8.2	7.4

persistence levels, either in job creation or in job destruction. Moreover, apart from birth and death, persistence levels are similar for the same component in job creation and job destruction.

4.3 Results by plant characteristics

The trend of lower rates of job flows for industries with significant public sector elements we saw in Table 5 is reproduced when we analyze the job mix component. The same happens regarding manufacturing associated with the

Table 11: Persistence of job flows after one and two years: upper bounds

	standard	1 year later	2 years later
creation	**25.3**	**16.7**	**11.9**
birth (bth)	6.8	4.7	3.4
job mix (mix)	7.5	4.7	3.4
ongoing job categ. (old)	11.0	7.3	5.1
destruction	**26.1**	**23.8**	**22.9**
death (dth)	7.7	7.7	7.7
job mix (mix)	8.6	7.7	7.5
ongoing job categ. (old)	9.9	8.4	7.7

Table 12: Gross job flows by plant–industry

	jcbth	jcmix	jcold	jdold	jdmix	jddth
industry	6.4	6.9	11.5	10.9	8.9	2.8
manufacturing						
trade	10.9	11.2	11.1	8.8	13.3	2.9
utilities	3.3	3.5	6.2	10.7	5.1	0.9
agriculture	9.6	8.4	11.8	9.6	10.0	2.6
construction	11.8	11.0	18.8	17.2	14.5	4.9
public administ.	3.1	3.9	8.9	7.4	3.0	1.9
mining, gas, oil	7.8	9.0	11.1	10.8	10.5	2.3
hotel, restaurants	11.8	8.9	11.3	8.4	10.6	3.1
transport, comun.	6.3	5.2	9.7	9.2	6.5	2.4
financial	4.7	9.4	9.8	12.3	12.4	1.3
education	3.9	6.7	10.1	7.3	6.8	2.1
health	4.2	6.5	9.3	6.6	6.0	1.4
serv for firms	7.6	8.7	14.9	10.5	8.9	3.0
serv for individuals	6.7	9.3	10.2	8.7	9.1	1.9

lowest levels of job flows. These results are reported in Table 12.

Table 13 shows the results for the 2 digit groups in manufacturing. When we look to the job mix component we see that the homogeneity of the numbers across industries present in Table 6 is preserved, especially for job destruction.[7]

The trend of negative correlation in job flows with age and size is reproduced when we isolate the job mix component. Table 14 reports that job creation have strong negative correlation with both age and size, as oposed to the dominant effect of age reported in Table 7. Table 15 reports the same pattern reported in Table 8, with the size effect dominating the results.

5 Robustness analysis

Misclassification of job categories by the respondent may introduce measurement error in our analysis. In particular job creation and/or job destruction will be artificially inflated if a specific job position, in a given plant, is classified in different codes in two consecutive years. In this section we check the potential relevance of this source of bias, for two particular cases of inconsistent job category classification. We are particularly interested in checking

[7]In the case of job creation there are two outlier industries with rates lower than 5% for this component.

Table 13: Gross job flows by plant industry: 2 digit manufacture sectors

	jcbth	jcmix	jcold	jdold	jdmix	jddth
manufacturing	7.9	6.5	11.8	10.6	9.8	3.0
food						
tobacco	6.4	6.4	10.3	12.7	7.9	1.9
textile	5.2	5.1	10.5	11.6	7.4	3.0
clothes	7.9	7.4	12.8	10.8	9.7	3.1
leather, shoes	7.7	3.2	12.5	9.7	6.1	3.6
wood	7.4	9.7	13.1	10.2	10.5	2.3
cellulose, paper	6.0	6.6	9.9	10.6	8.6	3.1
publishing, printing	5.7	8.6	10.9	10.1	9.4	2.1
coke, petrol, fuels	2.1	6.4	18.0	17.0	7.9	1.8
chemical	5.7	7.7	10.5	10.2	10.1	2.8
plastic, rubber	5.0	6.8	11.2	10.6	7.7	2.7
non-metallic minerals	5.5	8.1	11.0	9.5	9.0	2.1
primary metals	6.3	6.9	9.7	11.7	8.9	2.9
Fabricated metals	4.9	9.1	12.1	11.3	9.2	2.5
Non-electric machines	3.9	6.7	10.7	11.7	8.1	2.0
computer, office machines	7.5	8.2	14.7	13.1	12.3	2.7
electric equipments	5.9	7.0	11.1	11.5	8.8	2.9
eletronical	7.4	6.7	14.5	14.4	10.9	3.8
instruments	3.2	9.3	10.6	10.4	9.7	2.3
automobile	6.5	4.0	9.1	10.9	6.9	2.7
transport equipments	6.2	6.9	12.9	16.8	9.0	3.2
furniture	6.0	8.7	12.9	10.5	9.3	2.3
recycling	12.1	11.2	13.8	9.7	9.3	2.7

Table 14: Job mix component in job creation by age and size categories

	(0;5)	[5;10)	[10;50)	[50;250)	[250;1000)	≥1000
2nd year	27.8	28.0	21.8	18.2	13.0	12.3
3rd year	24.4	20.6	17.1	12.0	9.7	8.6
4th year	22.3	18.5	13.2	10.0	4.9	5.0
5th year	21.5	16.9	13.3	9.3	6.2	1.6
6th year	22.2	15.8	12.0	8.7	8.9	8.2

Table 15: Job mix component in job destruction by age and size categories

	(0;5)	[5;10)	[10;50)	[50;250)	[250;1000)	≥1000
2nd year	35.8	21.4	15.3	11.9	8.0	5.6
3rd year	33.4	20.6	14.8	10.8	8.2	3.3
4th year	31.7	19.7	13.5	11.7	7.5	3.4
5th year	30.9	18.1	13.1	9.7	7.6	6.4
6th year	28.0	17.9	13.2	8.5	3.1	4.1

Table 16: Influence of residual job categories

	unrestricted	restricted
Creation	**25.4**	**24.9**
birth/death (bth/dth)	6.8	6.8
job mix (mix)	**7.4**	**7.2**
ongoing job categ. (old)	11.1	10.9
Destruction	**20.5**	**19.9**
birth/death (bth/dth)	2.6	2.5
job mix (mix)	**8.4**	**8.3**
ongoing job categ. (old)	9.5	9.1

if the high significance of the job mix component may be affected by the measurement errors.

5.1 Residual job categories

The first is the inappropriate use of some residual job categories among the 350 original ones. Some job positions may be classified as a residual job category in a particular year and as a non-residual one in the following year (or vice-versa).[8]

Table 16 compares our original numbers for job flows with corresponding ones computed for a restricted sample, which excludes 42 residual job categories.

The numbers show that results are not sensible to the consideration of jobs created and destroyed in these categories. Both job creation and destruction drop only 0.5%. In particular the job mix components drops no more than 0.2%.

From now on we will use the restricted sample as the standard.

[8]This is more likely to happen with job positions which are not straightforwardly identified with non-residual codes.

Table 17: Influence of job categories aggregation

	3 digit	2 digit
Creation	**24.9**	**23.9**
birth (bth)	6.8	6.8
job mix (mix)	7.2	5.9
ongoing job categ. (old)	10.9	11.1
Destruction	**19.9**	**18.9**
death (dth)	2.5	2.6
job mix (mix)	8.3	7.2
ongoing job categ. (old)	9.1	9.1

5.2 Job category aggregation

The second particular case of inconsistent job category classification involves two non-residual job categories. The use of narrowly defined job categories tend to increase the probability of finding two or more job categories with high degree of similarity. This similarity may induce the respondent to classify a particular job position as one job category in a given year and as another similar one in the following year.

Table 17 compares the numbers for job flows when we use the job category variable coded at two digits and three digit levels.

We can see that the job mix component still represents 25% and 38% of job creation and destruction, respectively. Therefore we may conclude that the relevance of the job mix component can not be attributed to measurement errors.

6 New results: analysis by job characteristics

In order to gain insights into what the job creation and job destruction represent, we suggest a baseline structure which reflect the set of activities that takes place within the establishments. We consider the following activities: procurement, inventories, production, sales, and accounting and finance. Moreover we can also identify different tasks within each activity block. These tasks originates different hierarchical positions, such as line workers, supervisors and managers.[9]

[9]There are other papers which also explore the job characteristics dimension in their analysis of topics related to employment dynamics. For instance, Abowd et al. (1999) present some results on worker flows and net employment growth. They rely on broad job classification related to hierarchy positions. The consideration of job characteristics according to the activities performed in a firm is considered in Maurin and Thesmar (2004)

Unfortunately, it is not possible to identify all the tasks for each activity block. Therefore for our data we use the following classification:

- line workers in the production
- support for production
- supervision for production
- management in production
- line workers + supervision in procurement
- management in either procurement or sales or accounting/finance
- line workers in inventories
- supervision in inventories
- line workers in sales
- supervision in sales
- line workers in accounting/finance
- supervision in accounting/finance
- technical support for non-production activities
- non-technical support for non-production activities
- other supervisors
- other managers
- owners/top management

6.1 Results by proposed occupational groups

Computing job creation and job destruction rates by the proposed structure can help us to identify what kind of organizational change are summarized by our numbers in Table 9. Table 18 reports the results.

Managers tend to have the higher rates of job creation and destruction. Line workers tend to have lower rates of job creation and job destruction

, in their analysis on employment growth according to industry groups.

Table 18: Gross job flow by job characteristics

	Creation	Destruction
aggregate	**24.9**	**19.9**
Production		
Line workers	23.3	18.1
support	28.1	24.4
supervisor	29.9	27.6
Procurement		
Line + supervisors	30.1	26.8
Inventories		
Line workers	29.1	24.9
supervisor	29.1	28.8
Sales		
Line workers	32.1	22.9
supervisor	38.1	27.0
Finance/accounting		
Line workers	27.0	25.4
supervisor	24.7	27.2
Non-production Support		
Technical	24.0	23.4
non-technical	25.1	19.8
supervisor	25.3	25.0
Manager		
production	33.5	29.0
procurement,sale,finance	34.7	27.0
administrative	36.5	29.1
Board/owners	21.9	25.6

Table 19: Job mix part by job characteristics

	Creation	Destruction
aggregate	**7.2**	**8.3**
Production		
Line workers	5.7	6.8
support	10.2	11.6
supervisor	10.8	14.1
Procurement		
Line + supervisors	15.4	16.4
Inventories		
Line workers	8.8	10.6
supervisor	12.5	14.9
Sales		
Line workers	8.1	11.2
supervisor	12.2	13.2
Finance/accounting		
Line workers	12.1	13.5
supervisor	12.8	16.2
Non-production Support		
Technical	10.1	11.8
non-technical	8.4	8.2
supervisor	10.1	12.8
Manager		
production	17.1	18.1
procurement,sale,finance	16.2	16.6
administrative	20.0	19.3
Board/owners	7.0	10.9

than their respective supervisors. Among different activities, line workers in production has the lowest rates.[10]

Table 19 shows that exactly the same pattern mentioned above is valid to describe the job mix component by the proposed structure.

These results indicate that organizational changes that reflect changes in managerial structure tend to be relatively more important than the ones that reflect changes in production technology.

7 Selected considerations on organizational structure

This section lists some specific considerations on "how to produce" and "what to produce" that appears in economic theory.

In economic theory, the available ideas are all related to decisions on specialization, which can be split in three layers.

The first one is the decision on the product or products which the firm will sell. This is usually referred as product diversification. Jovanovic (1993) and Klette and Kortum (2004) provide analytical frameworks to address this decision.

The second decision is, for a given product, which parts of the production process should be internalized by the firm and is usually referred as the "make or buy" decision. Gibbons (2005) provides an extensive and comparative survey about what drives the firm's decision concerning this dimension of organizational structure.

Finally, conditioned on the first two decisions, firm also decides on which tasks can be aggregated to constitute a single job position. For instance, some workers may perform more than one task while output level is low and then set to perform only one task while output level grows. Rosen (1978) and Becker and Murphy (1992) are important references on this decision.

8 A closer look on job flows and organizational structure

The decision about which part of the production process should be internalized can be split in two parts. One is related to intra firm organizational decisions, i.e., some activities may be removed from one plant to another

[10]Since this is the biggest group in our sample, we have aggregate numbers quite close to the value of this group.

Table 20: Influence of organization aggregation

	plant	firm
creation	**24.9**	**22.6**
birth (bth)	6.8	4.6
job mix (mix)	**7.2**	**6.4**
ongoing job categ. (old)	10.9	11.7
destruction	**19.9**	**17.6**
death (dth)	2.5	1.7
job mix (mix)	**8.3**	**6.5**
ongoing job categ. (old)	9.1	9.4

one which belongs to the same firm. The other part is related to inter firm organization, i.e., a plant may hire another organization to develop part of the activities necessary to the production process. This is commonly refereed as outsourcing. We will analyze these two parts separately in the following sections.

8.1 Intra-firms reallocation

Our data allow the identification of establishments within the same firm. This can be used to investigate the relevance of intra firm organizational decisions on job flows. If these decisions were an important source of job flows, then we would have significantly smaller job flow figures when computing them at the firm level. Table 20 shows the figures for all components of job creation and job destruction, when computed both at the firm and plant level.

One can see that the figures do not change very much. It means that the job reallocation figures presented so far reflect mainly inter firm job reallocation, instead of intra-firms reallocation.

8.2 Out-sorcing

Another potential explanation for job flows related to the make or buy decision is the practice of out-sorcing a part of the activities to another company. We have no direct indication about the happening of this process. What we show in Table 17 is the contribution of job categories commonly associated to this scheme, such as security, cleaning and food provision. The results related to the job mix component can be related to outsourcing, under the assumption that the activities corresponding to these job categories should always be performed. Therefore the results in the bottom part of Table 21

Table 21: Decomposing job flow among non-production support

	Creation	Destruction
Total job flows	**28.1**	**23.0**
outsourcing	12.0	9.3
other	16.1	13.7
Job mix component	**9.8**	**10.6**
outsourcing	4.2	4.3
other	5.6	6.2

Table 22: Decomposing job flow among production line workers

	Creation	Destruction
Total job flows	**25.2**	**19.8**
main product	15.9	12.1
other product	9.3	7.8
Job mix component	**6.2**	**7.7**
main product	2.9	4.1
other product	3.3	3.6

can be taken as an upper bound of the contribution of outsourcing to job flows.

The results indicate that outsourcing represents at most around 40% of the job flows in non-production non-technical support. If one take into account that this last category is one with the lowest job flow rates, then we may conclude that outsourcing is not one of the most relevant sources of job flows.

8.3 Product diversification

There is evidence that changes in the product mix is quite common.[11] Therefore it might be the case that these changes are pushing the changes in the job mix. Once again we have no direct indication about the happening of this process.

However an alternative strategy to identify the contribution of this phenomena relies on identifying among the blue collar group, a sub-group of job categories related to the core activity of the firm and another related to other activities.[12]

What we show in Table 22 is the contribution of each of these sub-groups.

[11] See Bernard et al. (2003)

[12] Note that this analysis is also related with vertical integration.

Table 23: Job mix decomposition according to labor division

	Creation	Destruction
job mix	7.2	8.3
labor division	3.8	5.4
other	3.4	2.9

Line workers dealing with the main product have the highest contribution to the job flows of the line workers in production.[13] If one take into account that line workers in production is the job category with the lowest job flow rates, then we may conclude that product diversification is not one of the most relevant sources of job flows.[14]

8.4 Labor division

We propose and implement a methodology to identify the relevance of labor division on job creation and job destruction. This is based on the computation of job flow components, in particular the job mix, when we consider that jobs are defined as one of the 17 groups defined in section 5.

We assume that all activities listed on section 5 have to be performed by someone. Therefore if there is a job creation when jobs are defined using these broad groups, we say that this is due to labor division, since the related task was necessarily already done by someone who was probably accumulating more than one task.

Table 23 shows a decomposition of the job mix component (first line) in two factors. The first is related to labor division, which is computed as explained above, while the second is a miscellaneous factor. Table 24 reports the labor division component by the 17 job categories.

One can see that according to our methodology labor division is responsible for more than half of the job mix component. This points to the relevance of the decision to use specialized or non-specialized workers among possible sources of organizational change.

[13] These results rely on an extensive algorithm where job categories are assigned arbitrary to the core group in each one of the 4 digit industry categories. This association is quite straightforward in some industries, but rather cumbersome in others. Therefore we left some industries out of this analysis.

[14] However it is interesting to note that in the case of job creation the contribution of line workers dealing with other products is the highest for the job mix component.

Table 24: Labor division by job category

	Creation	Destruction
average	**3.8**	**5.4**
Production		
Line workers	2.0	3.7
support	6.3	8.1
supervisor	10.7	14.1
Procurement		
Line + supervisors	15.4	16.4
Inventories		
Line workers	8.8	10.6
supervisor	12.5	14.9
Sales		
Line workers	6.9	10.2
supervisor	12.2	13.2
Finance/accounting		
Line workers	9.6	11.2
supervisor	12.8	16.2
Non-production Support		
Technical	6.8	8.8
non-technical	3.7	4.4
supervisor	10.1	12.8
Manager		
production	15.5	16.6
procurement,sale,finance	16.2	16.6
administrative	20.0	19.3
Board/owners	6.4	10.5

8.5 Related literature

Three papers, Hamermesh et al. (1996), Lagarde et al. (1996) and Salvanes and Forre (2003) have made some contributions in similar directions.

Hamermesh et al. (1996) distinguishes hires for created jobs and separations corresponding to destroyed jobs. However they don't have any information on job characteristics and the size of their sample is quite small for any further investigation on the determinants of job flows.

Like us, Lagarde et al. (1996) also distinguishes workers according to job categories. However their focus is on the relationship between job flows and labor flows.

Salvanes and Forre (2003) also distinguishes workers within a plant. However they use education as a proxy for job characteristics. Different from the other two papers, the paper analyses underlying causes of job creation and job destruction related to skill biased technical change, which is related to the "how to produce" question we have discussed.

9 Summary and conclusion

In this paper we proposed an alternative measure for gross job flows, incorporating within plant job reallocation. Based on data with detailed information about workers occupation, we report the following results.

First we show that most of the stylized facts about job reallocation do not change when we take into account within plant job reallocation.

We then decompose the job creation and job destruction figures introducing a novel component, namely, the jobs created (destroyed) due to the birth (death) of job categories in incumbent (surviving) establishments. It turns out that the new component corresponds to 30% (40%) per cent of job creation (destruction). We refer to this component as the job mix component.

Also, we describe patterns of job reallocation, and each of the components, by job characteristics as opposed to workers characteristics. It is shown that the job mix component of both job creation and destruction are concentrated among non-production activities and managerial positions.

We interpret these results as evidence that organizational change should be considered as one of the most relevant underlying causes of the employment movements reflected by job creation and job destruction measures.

Finally we evaluate the relevance of specific dimensions of organizational change, such as intra-firm reallocation of job categories, outsorcing, changes in the product mix, and labor division. The results points to labor division as the most relevant dimension of organizational change among the ones

considered.

10 Appendix: Data manipulation

The following screening procedure were employed to original data:

1- deletion of individuals with invalid id code (missing or zero). 2- deletion of establishments with more than one spell from 1991 to 2002. This is to avoid overestimation in job creation and job destruction figures due to establishment that although in operation did not have their information processed in a particular time period. 3- Merge the following duplicated job codes pairwise: 073 and 193-Social worker; 074 and 194-Psychologist; 093 and 110-Accounter; 162 and 454-Decorator.

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