

Clicking towards Mozambique's New Jobs: A research note

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Keywords: Big data, Labour market information systems, Internet, Matching.

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Online jobs portals can be an important source of labour market information, also in developing countries. This paper presents an illustration from Mozambique, a country that has exhibited high economic growth rates but limited employment creation as other countries in Sub-Saharan Africa. First, we highlight the potential but also pitfalls of these portals in characterising and improving the functioning of the labour market. We then analyse the micro (mouse-click-level) data made available by a portal focused on the formal sector of the Mozambique labour market. Our evidence is also consistent with high levels of unemployment and or underemployment. The findings are also suggestive of mismatches between labour demand and the supply of schooling and training.

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1 Introduction

Despite the high growth rates that have been observed in several developing countries in Sub-Saharan Africa and elsewhere over the last years, employment has generally grown at lower rates (Fox et al. 2017). This contrast reflects in many cases the particular sectoral drivers of economic growth, such as the extractive industries, which are particularly capital intensive. Another important determinant of the relatively poor jobs performance of such countries, which is the subject of this paper, concerns the early stages of development of a number of labour market services, namely those responsible for promoting the matching between labour demand and labour supply. For instance, while developed countries tend to draw on large public employment services agencies that promote labour matching, deliver active labour market policies (including training), administer unemployment benefits, regulate temporary work agencies, and compile labour market information, many developing countries do not have or are only now beginning to introduce such activities. Moreover, private employment agencies - including in the areas of recruitment or temporary work - tend to face a number of constraints, following from legal barriers and high levels of informality and rural work.

This paper examines the potential of information technologies, in particular the internet, to overcome some of the obstacles above to a better functioning labour market in developing countries and to increase the employment impact of economic growth. We focus on the case of online jobs portals, which can register, profile and match jobseekers and vacancies, thus potentially greatly facilitating the labour market ongoing adjustment process. The contribution of online jobs portal may be particularly significant as they can have a very extensive geographic and occupational scope, covering virtually the entire labour market, including the informal and rural sectors. This is especially true as (smart or more basic) mobile phones become widely usable and disseminated, even in rural areas. Moreover, online jobs portals can also contribute not only to matching activities - they may also be an important source of labour market information for the general public as well as for policymakers. Last but not least, all matching and information generated can be achieved at little cost, particularly from a marginal perspective.

To discuss the potential but also challenges of online jobs portals, we present here a case study of one concrete portal, targeted at formal employment and operating in Mozambique since 2012. This portal, 'Emprego.co.mz' ('Employment', in Portuguese) is run by a private

technology firm and is based from Mozambique's capital, Maputo, although it has a national coverage. As indicated above, this portal can play an important role in the labour market given the many employment-related challenges faced in the country. Despite high growth rates over the last years, Mozambique is still one of the poorest countries in the world. Its labour market is characterised by high informality, high percentages of rural work - despite growing urbanisation -, and relatively high unemployment amongst the youth and in urban areas according to the limited data available. While Mozambique already has a public employment services agency, given funding constraints, it currently displays a limited physical presence across the country, particularly in the labour matching and information activities, and does not deliver online services.

This study seeks to shed some light on the labour market of Mozambique and contribute towards its labour market information system. Furthermore, this is one of the first pages to provide evidence on the potential contribution of online jobs portals (in general potentially covering both formal or informal work), particularly in developing countries, and on the nature of the matching achieved by such portals. This paper therefore contributes to the emerging literatures that use portals' data to research the labour market (Kuhn & Shen 2013, 2015, Kurekova et al. 2015, Marinescu 2016) or which examine the contribution of the internet matching in the functioning of the labour market (Kuhn & Mansour 2014, Belot et al. 2015, Faberman & Kudlyak 2016). For instance, Kuhn & Mansour (2014) finds that internet job search can reduce unemployment durations by 25%, when used to send out resumes and fill out applications. On a different but related theme, the role of internet access to promote economic activity, Hjort & Poulsen (2017) find that the arrival of submarine internet cables in Africa affected employment positively. See also a number of policy contributions on the design and implementation of labour market information systems in developing countries, including Sparreboom & Powell (2009), Woltermann (2012) and Sorensen & Mas (2015).

The structure of the remaining of the paper is as follows: The next section discusses in more detail the potential of online jobs portals. Section 3 presents the portal that we examine and its data set and descriptive statistics. The main results from our data analysis are presented in Section 4. Finally, Section 5 concludes.

2 Online jobs portals

There are multiple potential sources of (micro)data that can facilitate the development of evidence-based labour market policy. These sources include labour force surveys, social security data (including records of salaries and social benefits), surveys or censuses of firms or education/training providers, and public and private employment services data (registrations, placements, etc). These data sets differ in several dimensions, including in labour market coverage, frequency, longitudinal dimension, and the range of variables included, but all are of value in characterising a labour market and supporting policy. Unfortunately, many of these data sets are not available (at least not on a regular basis) in developing or in emerging countries. Even in the arguably most important case of labour force surveys, these can prove too costly for labour ministries or statistical agencies. Labour force surveys are also be subject to technical requirements that can be difficult to meet, namely in terms of representativeness, which if not followed can then compromise their policy potential.

One promising new source of data in this context are online jobs portal (henceforth referred to as portals), of the type examined in this paper. These data sets can list both jobseeker and vacancy registrations, updated on a high frequency basis, as submitted by individuals looking for a first or a new job and by firms, respectively. The registration will typically involve entering several of the characteristics of the jobseekers and the vacancies, including occupation, industry, experience, and location. In the case of jobseekers, registration may also include personal information, a CV (in open format or following a structure indicated by the portal), reference letters, certificates of qualifications, and personal statements regarding motivation, goals or general preferences. The firms that post vacancies may be the ultimate employers or, alternatively, temporary or other employment intermediation agencies. In the latter case, the vacancies are posted on behalf of the ultimate employers or the users of the labour.

Following the registrations of jobseekers and vacancies, portals can also deliver services in profiling and matching. These are based on the (automatic) comparison of the characteristics of the different characteristics of each jobseeker and each vacancy, towards the identification of potentially suitable pairs. A long or short (ranked) list can then be submitted to either or both jobseekers and firms that posted vacancies that may decide to apply or contact each other for possible interviews or other form of preliminary interaction before an appointment

eventually takes place. In some cases, portals can also follow up the matching process

Besides their relevance as a source of labour market information for policy-makers, portals can also have a number of effects directly upon the labour market through several channels. Indeed, labour markets tend to be particularly intensive in information, given the very many and always changing characteristics of human labour. Here we offer a classification of the potential channel of effects of portals, which we group into four categories: labour market thickness, matching costs, matching quality, and inequality. In the first channel, portals will make the labour market thicker, by pooling together a larger number of vacancies and jobseekers and thus reducing the fragmentation of matching. This increase in thickness effectively increases both the number of firms and workers that can browse and successfully (and quickly) find suitable matches over multiple dimensions such as location, sector, occupation and experience.

Second, hiring and job search costs will drop, as online recruitment is significantly less expensive and more flexible than more traditional job advertising, such as newspapers, and physical applications with agencies. This drop in hiring costs will also have a positive effect on the likelihood that firms recruit, leading to an expansion of labour demand that will subsequently translate into increases in both employment and wage levels. Importantly, this price effect can be more relevant in the case of low-skill vacancies (whose labour demand tends to be more price elastic), thus having a negative impact upon wage inequality.

Third, following from the two effects above, the duration of unfilled vacancies will be reduced and the quality of job matches will increase. These two effects will lead to increases in firm performance, as the losses from not taking advantage from business opportunities that result from unfilled vacancies will be reduced. Moreover, the ability of recruiting better staff for new positions can also have an important effect on firm performance. The better match between the firm and the work will also reduce the need to reopen the vacancy, following a (voluntary or involuntary) separation that is more likely to emerge in low-quality matches. Part of these overall increases in profitability are also likely to be shared with workers, namely through individual or collective bargaining or national legislative changes, leading to improvements in wages and other working conditions.

Fourth, portals reduce the importance of social networks such as work colleagues, relatives and friends in job finding, with increasing relevance of individual skills, merit and productivity.

This change can make the labour market more meritocratic and fair, particularly in the case of the (long-term) unemployed that otherwise tend to be increasingly cut off from job opportunities. The increase in labour market thickness described above can also reduce the market power of participants, in particular firms, leading to greater transparency and fewer disparities in wages (and working conditions more generally) for similar workers, implying remuneration levels more in line with productivity. This latter effect may be of considerable importance in reducing wage inequalities, perhaps particularly along the gender dimension.

Of course, portals do not only have positive effects. For instance, increasing reliance on such portals may increase 'e-exclusion', i.e. it may represent obstacles for labour market participation for those that are not familiar or do not have good access to the internet, in particular older individuals. However, internet penetration rates have increased dramatically over the last decade and are still increasing, including in Africa, to the point that 'e-exclusion' is unlikely to be a significant barrier, even in the near future. A different concern is that, as portals reduce the cost of job searching and job applications so substantially, many jobseekers may apply anyway to vacancies that may not be very suitable for them. If the screening algorithms developed by portals are not sophisticated enough, screening costs faced by employers may actually increase.

Coming back to the portal's role as sources of labour market information, from a public-policy perspective, it is important to highlight their potential in terms of 'nowcasting'. Indeed, a portal can deliver up-to-date information about labour market developments at an unparalleled very high frequency, for instance on a daily basis or, perhaps more relevant, on a weekly basis. This high frequency of information on jobseeker and vacancy registration can be very useful for policy, for instance as a tool to detect, on a real-time basis, instances of collective dismissals (e.g. following a surge in portal registrations of jobseekers previously working at the same industry and region). This high-frequency monitoring can also help in the implementation and evaluation of the impact of new (active labour market) policies, including those stemming from public-private partnerships in employment services (e.g. through the monitoring of the registrations and matches in different regions and or of different jobseekers).

As before, one will also need to acknowledge the limitations of portals, also in this specific dimension as providers of labour market information. First, portals will typically be a much better source of information on flows than on stocks. By definition, portals advertise vacan-

cies and jobseekers that are registered from a given point in time, therefore ignoring the stock of jobs that are already ongoing at a given point in time. Even if hiring (and separation) rates tend to be high, at 20% or more of the entire employment stock in developed countries, turnover can be greatly concentrated amongst a subset of (typically low-skilled, entry) occupations, therefore reducing the potential of portals as sources of representative overview of the entire labour market, at least in their first years of operation. However, this specific focus on flows is not necessarily a major drawback of portals, especially if labour ministries and other related agencies can already draw on complementary data sources (e.g. labour force surveys) to gather information on stocks. Furthermore, portals may also offer a biased overview of flows, if registrations are not equally likely across sectors, regions, or occupations, for instance, because internet penetration rates or social networks relevance vary across these dimensions. While these potential limitations should certainly be borne in mind and perhaps also estimated, from comparisons with the flow dimension of labour force surveys over similar periods in the two data sources), we believe that the net gains from portals can still be very significant.

3 Data

As indicated above, 'Emprego.co.mz' is a portal hosted at the <https://www.emprego.co.mz/> website, dedicated to formal-sector labour market matching. The portal is run by a private, domestic-owned IT firm and was launched in 2012. Its business model is based on fees charged to large firms that want to post their vacancies with the portal, while small firms and jobseekers can post their info for free. The portal, available in Portuguese and English versions, gathers data on four dimensions of vacancies and jobseekers, all of which were made available for this study. The first dimension concerns vacancies posted by firms, of which about 9,000 are registered in the data set we were able to access, covering the period 2012:m3 until 2016:m3. These jobs were consulted by prospective applicants a total of 15.6 million times over that period. This statistic highlights the remarkable interest generated by the portal amongst prospective jobseekers.

A second dimension concerns jobseekers and including records of 69,000 individuals. While not all variables of our 'Emprego.co.mz' data at this individual level are available for all jobseekers (some features were added gradually as the website was developed further), the

information available is still quite rich in most cases: Experience information is available for 58,000 individuals, schooling for 49,000, languages for 28,000, while personal variables such as gender only for 2,000. The last two dimensions of the data set involve the number of clicks on specific jobs - a total of 26,000 relating to 1,200 jobs - and the actual online applications (using the portal) - 46,000 applications submitted to 1,400 jobs, over the period 2014:m5 - 2016:m3. Unfortunately the data set does not, for the time being, make available information about matches between vacancies and jobseekers.

Using the information available, we present a number of descriptive statistics of the participants in the portal, both jobseekers and vacancies. In the case of the jobseekers registered, we found that, on average, they are 25 years old, they have 3.5 years of experience, and they have 13.4 years of schooling. Over 70% of the jobseekers for whom this information is available are searching on the job (i.e. searching while employed). 11% mention that they have at least a basic knowledge of English. We also find, again on average, each registered jobseekers applies to a little over eight different jobs using the portal.

From our analysis of the data set, we can also obtain interesting information on the labour demand side and some preliminary findings about the resulting matching. In particular, we find that the average number of days between the posting and the closing of a vacancy is relatively small, 12, an additional indication of the slack in the labour market. Moreover, we find that each vacancy is subject to approximately 1.700 clicks (including from individuals not registered in the portal whose clicks are also counted here). These clicks lead to over 250 applications per vacancy (i.e. approximately 15% of the clicks on vacancies lead to a job application).

4 Data analysis

In order to illustrate the potential opportunities and (and pitfalls) of portals, we present in this section a number of analyses based on the 'Emprego.co.mz' data. One important public policy area to which these data can contribute is the supply of skills by the education and training sector. The adjustment of supply towards evolving demand is a challenging process, in part because of its strong reliance on current and comprehensive labour market data. More specifically, to illustrate the potential of the 'Emprego.co.mz' portal in this regard, we assessed the job applications registered in the website to the 9,000 vacancies available, in

terms of their likely 'required schooling', following our reading of the vacancy description. While this assessment of 'required schooling' of vacancies involves some degree of subjectivity, we believe it has a strong correlation with their true 'required schooling'.¹

We then contrasted the schooling of the vacancy and the actual schooling of the job candidate across the multiple applications observed in the data set. This exercise seeks to understand if there is a good matching of jobseekers and vacancies at the application stage along the schooling level dimension. For instance, if we find that a 'large' percentage of applicants is willing to consider vacancies that require less schooling than what they have, that may be consistent with high levels of unemployment or underemployment. It may also be consistent with mismatches in the supply of skills by the education and training sector. Of course, for the time being, given the data available, the analysis is focused on the quantitative dimension of schooling. More detailed data could allow one to investigate further potential mismatches more specifically at the level of qualitative differences (e.g. differences between demand and supply across degree subjects).

From our analysis of the vacancies recorded in the data, we obtain an overall distribution of 'required' schooling as follows: 5% at the basic level, 51% at the secondary level, and 44% at the higher education level (including 22% at the technical-professional level). We then cross-tabulate the two variables, actual and required schooling, at the application level (not the vacancy level, as before). The results, presented in Table 1, suggest important mismatches between the profiles of the vacancies and the profiles of the candidates in the applications conducted through the website. For instance, we find that there is a large percentage of applications from jobseekers with secondary schooling to vacancies that require higher education (38.7% of their applications). At the same time, there also is a large percentage of jobseekers with higher education that apply to vacancies that only require basic education (51.8% of their applications). The latter result may be of greater concern from a policy perspective. As suggested above, the result may also be consistent with high levels of unemployment or underemployment, as well as low levels of job satisfaction. This high percentage of application to medium-skilled positions by highly-skilled individuals may also highlight issues in skills mismatch, not necessarily of 'over-education', given the low levels of schooling, but in terms of investments in schooling and, in particular, in higher education in areas of little demand

¹The overeducation literature, reviewed in (Leuven & Oosterbeek 2011) discusses several different methods of measuring schooling mismatches.

in the labour market.

A second subject that we consider with the data available is the interest that different vacancies or sectors generates amongst prospective job applicants. Our goal here is to provide some preliminary evidence about how different jobs compare in their 'attractiveness' amongst workers. We adopt a novel 'mouse-clicks' equation approach, in which we explain the (log) number of clicks of each job in terms of a set of industry or job fixed effects plus a number of control variables - the region where the vacancy is available, the time period when the vacancy was posted, and the number of days during which the vacancy was available online. While we do not offer a theory of the clicking behaviour by (prospective) job applicants, we argue that different industries or jobs will raise different levels of interest and this will be picked up by the number of their clicks. The control variables above seek to pick up potential correlations between the timing of the vacancies and their appeal with jobseekers that may otherwise lead to biased estimates about the actual relevance of the jobs. For instance, if some jobs tend to be posted at a time when more jobseekers go online because of seasonal factors (e.g. when students complete their qualifications), if one does not control for these timing effects one may overestimate the importance of those jobs.

Given the above motivation, our 'clicks' equation is as follows:

$$\log(Clicks_i) = \sigma_{s(i)} + \beta Duration_i + \alpha_{m(i)} + \gamma_{l(i)} + \epsilon_i, \quad (1)$$

in which $LogClicks_i$ is the logarithm of the total number of clicks registered with vacancy i , $\sigma_{s(i)}$ is a set of industry (or job) fixed effects, $Duration_i$ is the number of days during which the vacancy was available online, $\alpha_{m(i)}$ is a set of dummies regarding the month when the vacancy was published, $\gamma_{l(i)}$ is a set of regions (provinces) where the vacancies are based. We restrict our sample to jobs with at least five observations, resulting in a total of 215 different jobs.

Table 2 presents a selection of the results of the estimation of equation 1, focused on the coefficients of the industry effects, ranked in declining order of their magnitudes. We find significant differences across sectors in terms of the interest displayed by jobseekers online. For instance, the difference between the 10th and the 90th percentiles of the coefficients is of a factor of two. Moreover, we can also indicate what are the sectors that receive more and less interest. The former group includes Traineeships, Public relations, Client support, Banking

and a Miscellaneous category. On the other hand, the sectors that receive least interest are Public servants, Health and pharmaceuticals, Engineering, Legal, and Restaurants.

We also conduct a similar analysis but with job fixed effects instead of sector fixed effects. The results (not reported but available upon request) again indicate significant differences across jobs in terms of the interest displayed by jobseekers online. The difference between the 10th and the 90th percentiles of the coefficients is of a factor of three in this case. The jobs are the top and bottom of preferences are consistent with the results on sectors. For instance, trainee is one of the most clicked job (or occupation), while civil engineering, nurse or lawyer are some of the least clicked.

5 Conclusions

This paper illustrates the potential of online jobs portals to improve the functioning of labour markets, also in developing countries. By increasing the quantity and quality of labour market information widely available, these portals can provide more alternatives to (employed or unemployed) jobseekers and (current or prospective) employers. Discrimination will be eroded as information about wage levels and other working conditions can be better disseminated. Moreover, a more efficient labour market, leading to more jobs, shorter periods during which vacancies are unfilled, and better matches between employers and workers, can prompt increased firm performance, higher economic growth and more generous pay and other working conditions.

Our empirical illustration of online jobs portals is from Mozambique, still one of the poorest countries in the world, despite the high GDP growth rates of the last two decades. We draw on the data provided by a leading IT firm, established in the capital city of Maputo, which launched its formal-jobs 'Emprego.co.mz' portal in 2012. As discussed in the paper, although this and other equivalent portals-based data sets are not necessarily representative - probably not of labour market flows and most certainly not of its stocks -, the data lets researchers and policy makers understand better the challenges and opportunities faced in the labour market - and does so at little or no cost, particularly when compared to other approaches, such as running new surveys.

Amongst other results, we find that: 1) the number of applicants is much greater than that of vacancies, which is consistent with the perceived high levels of unemployment and

underemployment, particularly amongst the youth and in urban areas; 2) the job applications recorded further support the evidence above about of unemployment and underemployment, given the large percentages of workers that indicate to be interested in vacancies that require less schooling than their own; and 3) the sectors that are subject to greater interest from jobseekers tend to be less technical and more general (traineeships, public relations, client support, miscellaneous, etc) as opposed to those that came bottom in preferences (legal, engineering, health).

While the analysis presented here is of an illustrative nature, given that the portal was launched recently and its data set is continuously evolving, namely through the inclusion of new features, we believe the paper highlights the multiple potential uses of online jobs portals, including or even particularly in developing countries. One specific area in which these portals can be of great interest is that of labour market information systems, complementing other activities conducted by statistical agencies and public employment services but at much less cost. These portals can provide frequent (real-time even) statistics on the numbers of vacancies, jobseekers, hirings, by region, and industry. The portals can also offer profiles of the jobseekers and the vacancies, including their skills and working conditions. This information can help decision makers in the related fields of education and training, by adjusting the supply of skills towards the areas that offer greater labour market potential.

Finally, while this paper focuses on the case of the formal sector, portals can also target and be particularly informative about the informal sector. Indeed, the same company that is responsible for the 'Emprego.co.mz' portal examined here has also recently launched a companion website that targets the informal sector ('Biscate.co.mz'). We plan to examine this second portal in a follow-up research paper.

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Table 1: Schooling matching analysis of job applications

Applicants' schooling	Vacancies' 'Required' schooling			
	Basic	Secondary	Higher	Total
Basic	1,713 9.53	9,341 51.94	6,929 38.53	17,983 100
Secondary	1,806 11.29	8,001 50.01	6,193 38.71	16,000 100
Higher	2,922 9.22	16,411 51.81	12,345 38.97	31,678 100
Total	6,441 9.81	33,753 51.4	25,467 38.79	65,661 100

Notes: For each type of actual schooling, the first row indicates the number of observations per required schooling and the second row indicates their percentage. Own calculations based on 'Emprego.co.mz' data. Analysis at the applications level.

Table 2: Ranking of sectors, from 'Clicks' equation

Ranking	Sector	Coefficient	Obs.
1	Traineeships	0.998	76
2	Public relations	0.744	26
3	Client support	0.699	21
4	Miscellaneous	0.656	60
5	Banking	0.609	164
6	Commercial development	0.595	32
7	Secretarial	0.334	759
8	Communication and event	0.321	66
9	Research and analysis	0.314	98
10	Supervision and coordination	0.281	228
11	Human resources	0.232	256
12	Training and teaching	0.199	261
13	Acquisitions and Procurement	0.19	109
14	IT and programming	0.171	481
15	Sales	0.152	523
16	Security	0.136	150
17	Management	0.112	1226
18	Monitoring and evaluation	0.071	222
19	Finance and accounting	0.053	796
20	Hotels and tourism	-0.011	50
21	Marketing and advertising	-0.088	108
22	Transports and logistics	-0.11	491
23	Environment	-0.133	70
24	Media	-0.17	108
25	NGOs	-0.228	254
26	Manufacturing	-0.247	52
27	Auditing and consulting	-0.261	269
28	Agriculture and fishing	-0.262	77
29	Construction	-0.271	218
30	Arquitecture	-0.329	39
31	Design and Multimedia	-0.331	38
32	Maintenance	-0.396	615
33	Restaurants and bars	-0.421	44
34	Legal	-0.503	77
35	Engineering	-0.523	237
36	Health and pharmaceutics	-0.612	579
37	Public servants	-1.472	24

Notes: Own calculations based on 'Emprego.co.mz' data.